

# **9014, 9015, 9015 E, 9016 Printer**

Epson and IBM Proprinter Emulation

Programmer Reference Guide

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## Preface

This manual describes the IBM® Proprietary emulation as well as the Epson® LQ-2550 and ESC/P2 emulation.

### Brief description of the printer

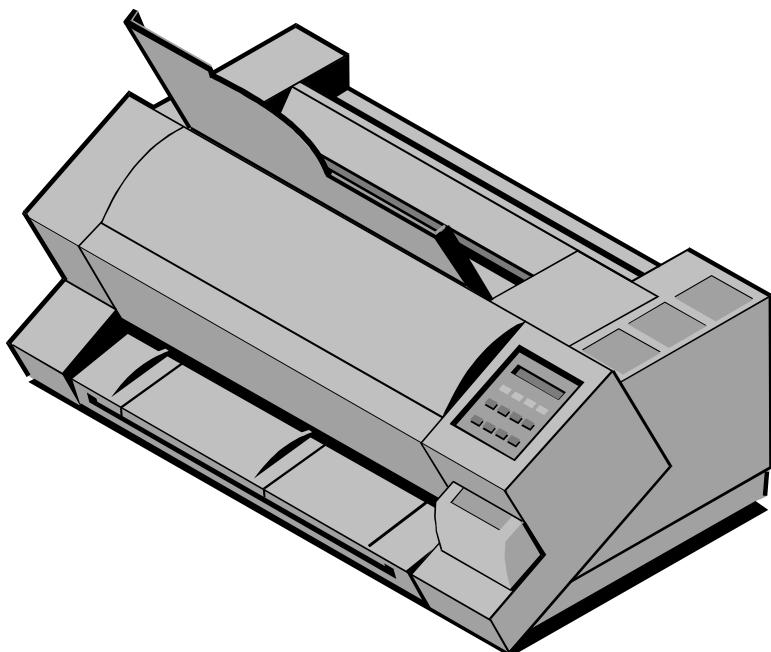
The 9014, 9015, 9015 E and 9016 printers are extremely fast 24 needle printers that emphasize convenient handling of paper and high performance.

The modern printer concept enables them to be used with Siemens data systems as workstation printers and for large print volumes.

The effective printing rate depends on various parameterizable functions such as, for example, form feed, sheet insertion and ejection, print modes etc.

Most printer functions can also be selected at the printer control panel. Function selection is menu-controlled.

## 9014 Needle Printer



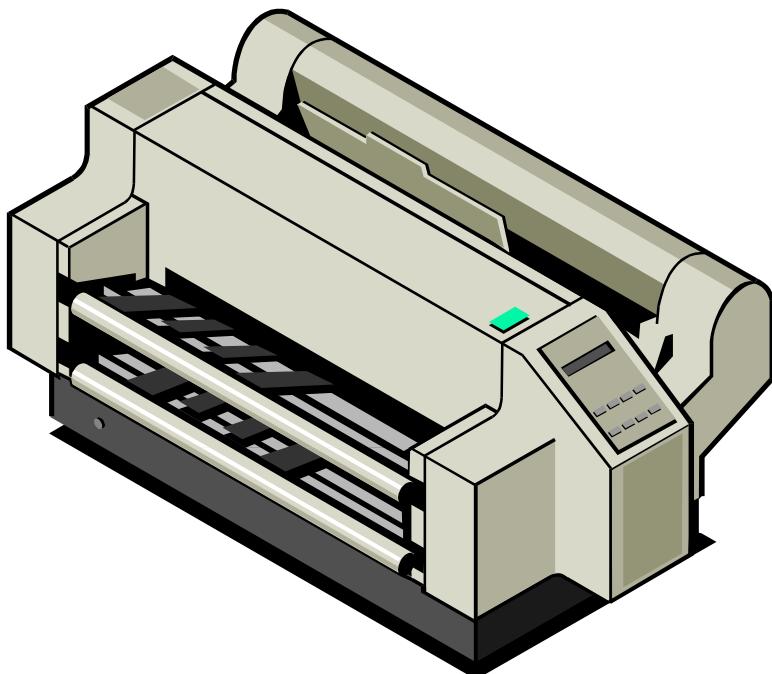
The 9014 printer is equipped with continuous forms tractor and manual single sheet insertion.

For automatic sheet feeding, the printer can be equipped with up to three ASF (Automatic Sheet Feeder) cassettes.

Different types of paper handling are available with the 9014 printer:

- single sheet (manual)
- continuous forms (tractor)
- single sheet (automatic)
- envelope (automatic)

## 9015 Needle Printer



Convenient handling of paper is available with the 9015 printer:

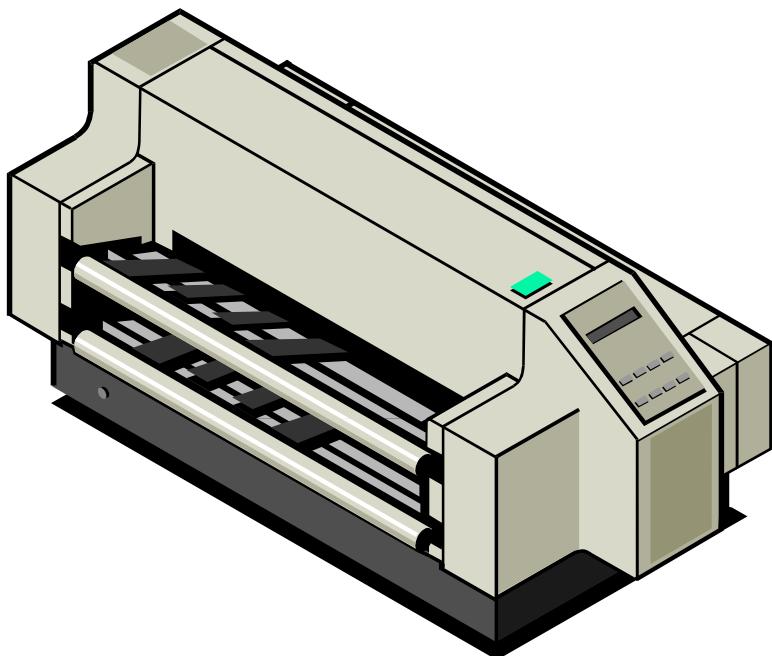
Using tractor cassettes, two continuous forms stacks can be inserted in a comfortable way.

A parking position for continuous forms handling is available.

There is no loss of sheets when you tear off continuous forms (Zero-Tear-Off-Function).

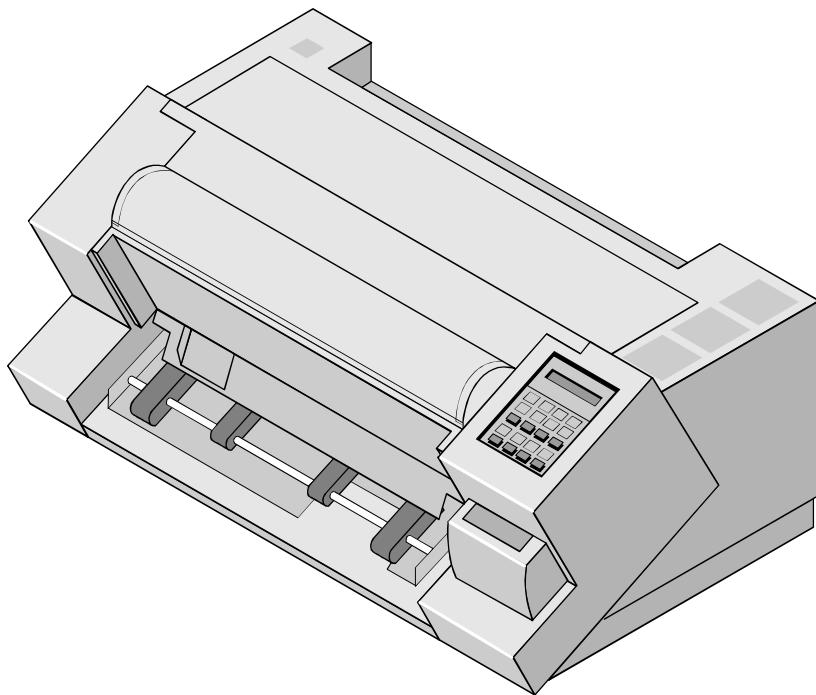
The printer offers a cut-off feature.

## 9015 E Needle Printer



The 9015 E needle printer offers the same attributes as the 9015 printer except from the cut-off feature. Additionally, the 9015 E printer can optionally be equipped with a manual single sheet insertion.

## 9016 Needle Printer



The fast high performance 9016 needle printer offers the handling of continuous forms (tractor) and, optionally, of single sheets (manual insertion).

## Target group

The contents of this manual is intended for users who want to program printer output.

Familiarity with printer programming is required.

## Summary of contents

This manual describes the control characters of the following Epson and IBM Proprinter emulations of the 9014 / 9015 / 9015 E and 9016 printer:

Dieses Handbuch beschreibt die Steuerzeichen der folgenden Epson- und IBM-Proprinter-Emulationen der Drucker 9014 / 9015 / 9015 E / 9016:

- Epson LQ-2550 / 1060 and ESC/P2
- IBM Proprinter emulations (IBM printers 4207, 4208 (XL24) )

The ECMA emulation is described in further Programmer's Reference Guides (see [1], [4]).

References in the text consist of numbers enclosed in square brackets.

The full titles of the referenced publications and manuals are given in the References chapter.

## Notational conventions

In this manual, the following conventions have been used:

<i>Italics</i>	Names of files, programs, commands, variables, options and screen texts such as input fields, text fields, menus etc. in plain text
Monospace	System output such as error messages, other messages, notes, excerpts from files
Monospace bold	User input in examples
“Quotation marks”	References to other chapters or manuals
	Keys or key combinations in plain text
➤	User activities
	Additional information, notes and tips
	Warnings that must be observed

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# Technical data and printer options

## 9014 printer interface modules

The 9014 printer with IBM Proprinter and Epson LQ-2550 emulation is equipped with the 90142-12 interface module. It contains a parallel (Centronics®-compatible) and a serial V.24 (RS-232 C) interface. The 9014 printer with the 90142-12 interface module is referred to below as the 9014-12 printer. There are two other interface modules with IBM / Epson emulation:

- 90142-13 with additional IGP functionality
- 90142-14 with additional East European character sets

For network connections, the following interface module is available:

- 90142-LE2 (Ethernet® LAN connection for Epson LQ-2550 and IBM Proprinter emulation)

The printer is also available with the ECMA emulation with one of the following interface modules:

- 90142-11 with SS97 (RS-422 A) and V.24 (RS-232 C)
- 90142-15 with SS97 (RS-422 A), V.24 (RS-232 C) and BAM controller
- 90142-LE1 (Ethernet® LAN connection for ECMA emulation)

The functions of the ECMA emulation are described in a separate Programmer's Reference Guide [4].

## 9015 / 9015 E printer interface modules

The 9015 printer with IBM Proprinter and Epson LQ-2550 emulation is equipped with the 90152-12 interface module. It contains a parallel (Centronics®-compatible) and a serial V.24 (RS-232 C) interface. The 9015 printer with the 90152-12 interface module is referred to below as the 9015-12 printer. There is another interface module with IBM/Epson emulation:

- 90152-13 with additional IGP functionality

For network connections, the following interface module is available:

- 90152-LE2 (Ethernet<sup>®</sup> LAN connection for Epson LQ-2550 and IBM Proprinter emulation)

The printer is also available with the ECMA emulation with one of the following interface modules:

- 90152-11 with SS97 (RS-422 A) and V.24 (RS-232 C)
- 90152-15 with SS97 (RS-422 A), V.24 (RS-232 C) and BAM controller
- 90152-LE1 (Ethernet<sup>®</sup> LAN connection for ECMA emulation)

The functions of the ECMA emulation are described in a separate Programmer's Reference Guide [1].

### **9016 printer interface modules**

With the 9016 printer, the serial RS-232 C / RS 422 and the Centronics<sup>®</sup> interface for the IBM Proprinter and Epson LQ-2550 emulation are integrated. Since this equipment of the 9016 printer is equivalent to the 9014-12 and 90152-12 printer types, the printer is referred to below as the 9016-12.

## Technical data

The following table lists the major technical data of the printer that is relevant to programmers.

Printing system	Print head with 24 needles
Print direction	Bidirectional with logic seeking
Print matrix	24 x 36 - letter quality (LQ) 12 x 36 - near letter quality (NLQ) 12 x 12 - draft (DRAFT)
Printing rate (characters per second)	175 - letter quality (LQ) 350 - near letter quality (NLQ) 700 - draft (DRAFT)
Printer buffer	16 Kbyte up to 48 Kbyte (programmable)
Column width (mm or inch)	Normal font 2.54 or $\frac{1}{10}$ 2.12 or $\frac{1}{12}$ 1.76 or $\frac{1}{14}, 4$ 1.69 or $\frac{1}{15}$ 1.49 or $\frac{1}{17}$ 1.41 or $\frac{1}{18}$ 1.27 or $\frac{1}{20}$
Micro-column width (inch)	$\frac{1}{120}$ for DRAFT $\frac{1}{180}$ for LQ/NLQ
Micro-line spacing (inch)	$\frac{1}{360}$
Character height (mm)	2.42 to 3.3 and thereof double, threefold, fourfold, up to eightfold height; DATA LARGE up to 999-fold height
Character width	single width: depends on the font and the selected character pitch; thereof double, threefold, fourfold up to eightfold width; DATA LARGE up to 999-fold width

## Character complement

The standard character complement of the printers contains up to fifteen fonts with several character sets. Some character sets can be used with different national versions.

Further information on fonts and character sets is given in the description of corresponding commands and in the tables (for the character sets see [Character set tables](#)).

## Options

The following options are currently available:

- 9014 printer
  - Automatic sheet feeder (ASF)
  - Console
- 9015 printer
  - Tractor cassette
  - Console with integrated paper rack
- 9015 E printer
  - Tractor cassette
  - Console with integrated paper rack
- Drucker 9016
  - Manual single sheet insertion
  - console

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## **Connection options of the 901x-12 printers**

The 901x-12 printers can be connected via the serial and parallel interface.

### **Serial interface V.24 (RS-232 C)**

The 901x-12 printers can be connected with the following systems via the V.24 interface (RS-232 C):

- Quattro / BNC / 886x systems
- RM systems
- Primergy systems
- PC's

### **Parallel Centronics interface**

The 901x-12 printer can be connected with the following systems via the Centronics interface:

- Primergy systems
- PC's

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## Description of the IBM Proprinter emulation

With the IBM Proprinter emulation, the 9014, 9015, 9015 E and 9016 printers behave like the 4207 and 4208 (XL24) printers from IBM.

The commands are divided into the following command groups:

- Initial condition
- Forms transport mechanism
- Forms layout
- Forms transport
- Print carriage movements
- Font design
- Bitmap graphics
- Miscellaneous commands

## Initial condition

After power-on, the printer is in the following condition:

- Printer buffer cleared
- All vertical tab stops reset
- Proportional spacing mode reset
- Horizontal tab stops set in every eighth column
- Print direction bidirectional
- Boldface mode off
- Double strike mode off
- Subscript/superscript mode off
- Expanded mode off
- Normal character height
- Underscore mode off
- Overscore mode off
- Character enlargement mode off

The following functions depend on the menu setting:

- Form length
- Perforation skip mode
- Left margin
- Right margin
- Line spacing
- Font (type style)
- Print quality (DRAFT, LQ, NLQ)
- Character set
- National version/IBM code page
- Character pitch
- Paper source

## Forms transport mechanism

The printer is always equipped with two continuous forms tractors. The last sheet of a continuous forms stack can be printed to the end of the form.

## Additional commands

### Eject sheet

Control sequence	Hexadecimal	Decimal
ESC [ < s	1B 5B 3C 73	27 91 60 115

This command causes a vertical form feed to the beginning of the next page.

### Select paper source and ejection, number of copies, cut-off mode

(SPS or SPSIF)

Control sequence	Hexadecimal	Decimal
ESC [ > p <sub>1</sub> ; p <sub>2</sub> ; p <sub>3</sub> ; p <sub>4</sub> s	1B 5B 3E p <sub>1</sub> 3B p <sub>2</sub> 3B p <sub>3</sub> 3B p <sub>4</sub> 73	27 91 62 p <sub>1</sub> 59 p <sub>2</sub> 59 p <sub>3</sub> 59 p <sub>4</sub> 115

**i** The control character > should only be used if an indent or a form feed (FF) is to be performed.

**i** p<sub>4</sub>= 0 to 1 is only available for the 9015 printer with cut-off feature.

- **9014 Printer**

$p_1 = 0$   
Manual single form feed

$p_1 = 1$  bis  $3$   
ASF, bin 1 to 3

$p_1 = 6$   
Ignored

$p_1 = 7$   
Tractor

$p_1 = 8$   
ASF, bin 1 or 2

$p_1 = 9$   
ASF, bin 2 or 3

$p_1 = 10$   
ASF, bin 1 or 2 or 3

$p_2 = 0$   
AGC (automatic gap control)

$p_2 = 1$  bis  $6$   
PCC = programmable copy control  
(Print gap for 1- to 6-ply copies)

$p_3 = 0$   
Cut-off sheets in upper tray

$p_3 = 1$   
Paper exit front side (confirmed by start/stop key)

$p_3 = 2$   
Paper exit front side, (not confirmed by start/stop key, but controlled by application)

$p_3 = 3$   
Batch output (rear side)

- **9015 Printer**

$p_1 = 0$  to 3  
Ignored

$p_1 = 6$   
Upper tractor

$p_1 = 7$   
Lower tractor

$p_1 = 8$  to 10  
Ignored

$p_1 = 15$   
Selection of both tractors (upper and lower)

$p_2 = 0$   
AGC (automatic gap control)

$p_2 = 1$  to 6  
PCC (programmable copy control)  
(Print gap for 1- to 6-ply copies)

$p_3 = 0$   
Cut-off sheets in upper tray

$p_3 = 1$   
Ignored

$p_3 = 2$   
Ignored

$p_3 = 3$   
Sheets in stack (default)

$p_4 = 0$   
Cut-off feature off (default)

$p_4 = 1$   
Cut-off feature on

- **9015 E Printer**

$p_1 = 0$

Manual single form feed

$p_1 = 1$  to  $3$

Ignored

$p_1 = 6$

Upper tractor

$p_1 = 7$

Lower tractor

$p_1 = 8$  to  $10$

Ignored

$p_1 = 15$

Selection of both tractors (upper and lower)

$p_2 = 0$

AGC (automatic gap control)

$p_2 = 1$  bis  $6$

PCC = programmable copy control  
(Print gap for 1- to 6-ply copies)

$p_3 = 0$

Ignored

$p_3 = 1$

Paper exit front side (confirmed by start/stop key)

$p_3 = 2$

Paper exit front side, (not confirmed by start/stop key, but controlled by application)

$p_3 = 3$

Batch output (rear side)

- **9016 Printer**

$p_1 = 0$   
Manual single form feed

$p_1 = 1$  to 3  
Ignored

$p_1 = 6$   
Ignored

$p_1 = 7$   
Lower tractor

$p_1 = 8$  to 10  
Ignored

$p_1 = 15$   
Ignored

$p_2 = 0$   
AGC (automatic gap control)

$p_2 = 1$  bis 6  
PCC = programmable copy control  
(Print gap for 1- to 6-ply copies)

$p_3 = 0$   
Ignored

$p_3 = 1$   
Paper exit front side (confirmed by start/stop key)

$p_3 = 2$   
Paper exit front side, (not confirmed by start/stop key, but controlled by application)

$p_3 = 3$

## Forms layout

The dimensions of the form can be selected freely. The following commands are available:

- Set form length in lines
- Set form length in inches
- Set perforation skip mode
- Reset perforation skip mode
- Set first print line
- Set left margin
- Set left and right margins

### Set form length in lines

Control sequence	Hexadecimal	Decimal
ESC C p <sub>1</sub>	1B 43 p <sub>1</sub>	27 67 p <sub>1</sub>

This command specifies the physical page length in multiples of the current line spacing and sets the current vertical position as the first print line (top of form).

The set page length is not affected by later changes of the line spacing.

p<sub>1</sub>      Form length in multiples of the current line spacing

Range:            X'01 ≤ p<sub>1</sub> ≤ X'7F  
The minimum valid form length is 3 inches and the maximum is 22 inches.

## Set form length in inches

Control sequence	Hexadecimal	Decimal
ESC C NUL p <sub>1</sub>	1B 43 00 p <sub>1</sub>	27 67 00 p <sub>1</sub>

This command specifies the physical page length in inches and sets the current vertical position as the first print line (top of form).

p<sub>1</sub> Form length in inches

Range: X'01 ≤ p<sub>1</sub> ≤ X'16  
The minimum valid form length is 3 inches and the maximum is 22 inches.

## Set perforation skip mode

Control sequence	Hexadecimal	Decimal
ESC N p <sub>1</sub>	1B 4E p <sub>1</sub>	27 78 p <sub>1</sub>

The perforation area is specified as a number of lines at the current line spacing. It is skipped at the end of every page.

The perforation area is not affected by later changes of the line spacing.

The perforation area should be selected so that at least  $\frac{4}{6}$  inch remain as print area.

If you change the first line (top of form), the perforation area moves accordingly.

p<sub>1</sub> Perforation area in lines at the current line spacing

Range: X'00 ≤ p<sub>1</sub> ≤ X'FF

## Reset perforation skip mode

Control sequence	Hexadecimal	Decimal
ESC O	1B 4F	27 79

## Set first print line

Control sequence	Hexadecimal	Decimal
ESC 4	1B 34	27 52

The current print line is defined as the first print line (top form). The first print line should be selected so that at least  $\frac{4}{6}$  inch remain as print area.

The set form length is not affected by this command.

## Set left margin

Control sequence	Hexadecimal	Decimal
ESC ;	1B 3B	27 59

The current print column defines the first printable character in the line and thus the left margin.

The set left margin is not affected by later changes of the character pitch.

The left margin should be selected so that at least  $\frac{4}{10}$  inch remain as print area between the left and right margins.



This function should not be used in new applications.

## Set left and right margins

Control sequence	Hexadecimal	Decimal
ESC X p <sub>1</sub> p <sub>2</sub>	1B 58 p <sub>1</sub> p <sub>2</sub>	27 88 p <sub>1</sub> p <sub>2</sub>

The parameters define the first and last print columns of a line at the current character pitch and thus define the left and right margins.

The first print column of a line is column 1. The set margins are not affected by later changes of the character pitch. The margin setting should be selected so that at least  $\frac{4}{10}$  inch remain as print area between the left and right margins.

This command must be located at the beginning of the line.

If you specify 0 (zero) for a parameter, the current margin setting is not affected.

p<sub>1</sub>      Left margin in columns at the current character pitch

Range:            X'00 ≤ p<sub>1</sub> ≤ X'FC

p<sub>2</sub>      Right margin in columns at the current character pitch

Range:            X'04 ≤ p<sub>2</sub> ≤ X'FF

## Forms transport

The following commands affect the paper movement:

- Set 8 lpi
- Set  $7/72$  inch line spacing mode
- Preset  $n/72$  inch line spacing mode
- Set preset line spacing
- Set  $n/216$  or  $n/180$  inch line spacing mode
- Set line spacing unit
- Line feed (LF)
- Reverse line feed
- Form feed (FF)
- Relative vertical tabulation forward
- Set vertical tab stops
- Vertical tabulation
- Additional commands

### Set 8 lpi

Control sequence	Hexadecimal	Decimal
ESC 0	1B 30	27 48

The line spacing is set to 8 lines per inch.

### Set $7/72$ inch line spacing mode

Control sequence	Hexadecimal	Decimal
ESC 1	1B 31	27 49

A line spacing of  $7/72$  inch is set.

## Preset n/72 inch line spacing mode

Control sequence	Hexadecimal	Decimal
ESC A p <sub>1</sub>	1B 41 p <sub>1</sub>	27 65 p <sub>1</sub>

A line spacing of  $n/72$  is preset. The defined line spacing is set by the *ESC 2* command.

p<sub>1</sub> Line spacing in  $1/72$  inch increments

Range: X'01 ≤ p<sub>1</sub> ≤ X'55

## Set preset line spacing

Control sequence	Hexadecimal	Decimal
ESC 2	1B 32	27 50

The line spacing preset with the *ESC A p1* command is set.

## Set n/216 or n/180 inch line spacing mode

Control sequence	Hexadecimal	Decimal
ESC 3 p <sub>1</sub>	1B 33 p <sub>1</sub>	27 51 p <sub>1</sub>

A line spacing of  $n/216$  or  $n/180$  inch is set depending on the line spacing unit (see [Set line spacing unit](#)).

The default is  $n/216$  inch.

p<sub>1</sub> Line spacing in  $n/216$  or  $n/180$  inch increments

Range: X'01 ≤ p<sub>1</sub> ≤ X'FF

## Set line spacing unit

Control sequence	Hexadecimal	Decimal
ESC [ \ EOT NUL NUL NUL p <sub>1</sub> NUL	1B 5B 5C 04 00 00 00 p <sub>1</sub> 00	27 91 92 04 00 00 00 p <sub>1</sub> 00

This command sets the line spacing unit to either  $1/_{216}$  inch or  $1/_{180}$  inch.

The preset line spacing unit only affects the two commands  $ESC 3 p_1$  and  $ESC J p_1$ .

p<sub>1</sub> Line spacing unit

Valid parameter values:

Dec	Hex	Meaning
180	B4	Line spacing $1/_{180}$ inch
216	D8	Line spacing $1/_{216}$ inch

## Line feed (LF)

Control character	Hexadecimal	Decimal
LF	0A	10

A line feed is performed using the current line spacing. The contents of the line buffer are printed.

This control character terminates the expanded mode for one line.



A carriage return is also performed depending on the menu setting.

## Reverse line feed

Control sequence	Hexadecimal	Decimal
ESC ]	1B 5D	27 93
ESC M	1B 4D	27 77

The reverse line feed is performed using the current line spacing. The contents of the line buffer are printed.

## Form feed (FF)

Control sequence	Hexadecimal	Decimal
FF	0C	12

The paper is advanced to the next top of form position. The contents of the line buffer are printed and a carriage return is performed.

This control character terminates the expanded mode for one line.

## Relative vertical tabulation forward

Control sequence	Hexadecimal	Decimal
ESC J p <sub>1</sub>	1B 4A p <sub>1</sub>	27 74 p <sub>1</sub>

The vertical print position is moved down by  $\frac{p_1}{216}$  or  $\frac{p_1}{180}$  inch depending on the line spacing unit (see [Set line spacing unit](#)).

The default is  $\frac{1}{216}$  inch.

p<sub>1</sub>      Relative vertical movement in  $\frac{1}{216}$  inch or  $\frac{1}{180}$  inch increments

Range:            X'00 ≤ p<sub>1</sub> ≤ X'FF

## Set vertical tab stops

Control sequence	Hexadecimal	Decimal
ESC B p <sub>1</sub> ... p <sub>k</sub> NUL	1B 42 p <sub>1</sub> ... p <sub>k</sub> 00	27 66 p <sub>1</sub> ... p <sub>k</sub> 00

A maximum of 64 vertical tab stops can be set. Previously set vertical tab stops are reset.

The vertical tab stops must be defined in ascending order in lines. The absolute vertical tab location depends on the current line spacing.

The line count begins with one at the first print line (see [Set first print line](#)).

The set vertical tab stops are not affected by later changes of the line spacing.

All vertical tab stops are reset if no parameters are specified (*ESC B NUL*).

p<sub>1</sub> ... p<sub>k</sub>      Vertical tab stops in lines (1 ≤ k ≤ 64)

Range:                    X'01 ≤ p<sub>k</sub> ≤ X'FF

## Vertical tabulation

Control character	Hexadecimal	Decimal
VT	0B	11

This control character causes vertical tabulation to the next vertical tab stop. Vertical tabulation is possible anywhere within a line.

Repeated specification of this control character causes vertical tab stops to be skipped. If you transfer *VT VT VT*, for example, the printer positions the print head to the third vertical tab stop. If no tab stops are set, this control character causes a line feed.

This control character terminates the expanded mode for one line.



A carriage return is also performed depending on the menu setting.

## Additional commands

### Load line spacing

Control sequence	Hexadecimal	Decimal
ESC [ p <sub>1</sub> {	1B 5B p <sub>1</sub> 7B	27 91 p <sub>1</sub> 123

This command loads and sets the line spacing. Valid values: 1, 2, 3, 4, 6, 8, 12, 16, 24, 48, 60, 72, 90, 144, 180, 360 lpi.

### Reset tab stop

Control sequence	Hexadecimal	Decimal
ESC [ p <sub>1</sub> g	1B 5B p <sub>1</sub> 67	27 91 p <sub>1</sub> 103

Valid values:

p<sub>1</sub> = 0

Reset tab stop at the current position

p<sub>1</sub> = 3

Reset all horizontal tab stops

p<sub>1</sub> = 4

Reset all vertical tab stops

## Print carriage movements

The following commands control the print carriage movements:

- Carriage return
- Print head to left margin
- Space
- Backspace
- Set 10 cpi
- Set 12 cpi
- Set 17.1 cpi
- Set/reset proportional spacing mode
- Relative horizontal tabulation
- Set horizontal tab stops
- Horizontal tabulation
- Set print direction (bidirectional or unidirectional)
- Additional commands

### Carriage return

Control character	Hexadecimal	Decimal
CR	0D	13

The print carriage moves to the beginning of the line. The character following *CR* is printed as the first character in the line.



A line feed may be performed in addition to the carriage return depending on the menu setting. When writing new application programs, be sure to terminate each line with *LF* and *CR*.

## Print head to left margin

Control sequence	Hexadecimal	Decimal
ESC <	1B 3C	27 60

The print carriage moves to the beginning of the line.

## Space

Control character	Hexadecimal	Decimal
SP	20	32

The print head moves one space width using the set or programmed character pitch.

If an expanded mode is active, the space width is increased accordingly.

## Backspace

Control character	Hexadecimal	Decimal
BS	08	08

Reverse movement by the width of one space.

## Set 10 cpi

Control character	Hexadecimal	Decimal
DC2	12	18

Set a character pitch of 10 cpi.

## Set 12 cpi

Control sequence	Hexadecimal	Decimal
ESC :	1B 3A	27 58

Set a character pitch of 12 cpi.

## Set 17.1 cpi

Control sequence	Hexadecimal	Decimal
SI	0F	15

Set a character pitch of 17.1 cpi.

## Set/reset proportional spacing mode

Control sequence	Hexadecimal	Decimal
ESC P p <sub>1</sub>	1B 50 p <sub>1</sub>	27 80 p <sub>1</sub>

In proportional spacing mode the character width differs. An i, for example, is narrower than an m.

Proportional spacing is possible with all fonts except the OCR fonts.

p<sub>1</sub> sets/resets proportional spacing

Valid parameter values:

Dec	Hex	Meaning
0	0	Reset proportional spacing mode
1	1	Set proportional spacing mode
48	30	Reset proportional spacing mode
49	31	Set proportional spacing mode

## Relative horizontal tabulation

Control sequence	Hexadecimal	Decimal
ESC d p <sub>1</sub> p <sub>2</sub>	1B 64 p <sub>1</sub> p <sub>2</sub>	27 100 p <sub>1</sub> p <sub>2</sub>

The horizontal print position is moved right by the defined amount. The specified shift begins at the current print position and has to be specified in  $1/120$  inch increments.

Spaces are shown underscored, overscored or crossed out if the function is active.

The defined right margin cannot be exceeded.

p<sub>1</sub> p<sub>2</sub> define the shift

$$\text{Shift} = (p_1 + (p_2 * 256)) * 1/120 \text{ inch}$$

$$\text{Range: } X'00 \leq p_1 \leq X'FF$$

$$\text{Range: } X'00 \leq p_2 \leq X'FF$$

## Set horizontal tab stops

Control sequence	Hexadecimal	Decimal
ESC D p <sub>1</sub> ... p <sub>k</sub> NUL	1B 44 p <sub>1</sub> ... p <sub>k</sub> 00	27 68 p <sub>1</sub> ... p <sub>k</sub> 00

This command sets horizontal tab stops. A maximum of 32 horizontal tab stops can be set. Previously set horizontal tab stops are reset.

The horizontal tab stops must be specified in ascending order in multiples of the current character pitch. The absolute horizontal tab stop locations depend on the current character pitch.

The set horizontal tab stops are not affected by later changes of the character pitch.

The default horizontal tab stop locations are in every eighth print column.

All horizontal tab stops are reset if no parameter is specified (*ESC D NUL*).

p<sub>1</sub> ... p<sub>k</sub>      Horizontal tab stops in multiples of the character pitch (1 ≤ k ≤ 32)

Range:                  X'01 ≤ p<sub>k</sub> ≤ X'FF

## Horizontal tabulation

Control character	Hexadecimal	Decimal
HT	09	09

This control character may be located anywhere within a line and causes tabulation to the next horizontal tab stop. Repeated specification of this control character causes horizontal tab stops to be skipped. If you transfer *HT HT HT HT*, for example, the printer positions the print head to the fourth horizontal tab stop.

Conditions for horizontal tabulation:

- At least one horizontal tab stop must be set.
- The printer ignores the control character if no horizontal tab stops are set or if tabulation exceeds the end of the line.
- If the print head is on a set horizontal tab stop, the next horizontal tab stop is accessed.

## Set print direction (bidirectional or unidirectional)

Control sequence	Hexadecimal	Decimal
ESC U p <sub>1</sub>	1B 55 p <sub>1</sub>	27 85 p <sub>1</sub>

Unidirectional printing should be used if high positioning precision is required (e.g. in the graphics mode). The default is bidirectional printing.

p<sub>1</sub> defines the print direction

Valid parameter values:

Dec	Hex	Meaning
0	0	Bidirectional print direction
1	1	Unidirectional print direction
48	30	Bidirectional print direction
49	31	Unidirectional print direction

**i** The command is ignored if the menu setting does not permit unidirectional printing (see [2]).

## Additional commands

### Absolute horizontal positioning

Control sequence	Hexadecimal	Decimal
ESC [ p <sub>1</sub> ‘	1B 5B p <sub>1</sub> 60	27 91 p <sub>1</sub> 96

*p<sub>1</sub>* defines the print position and consists of a maximum of three digits. *p<sub>1</sub> = 0* and *p<sub>1</sub> = 1* define the first print position and thus have the same meaning.

### Relative horizontal positioning

Control sequence	Hexadecimal	Decimal
ESC [ p <sub>1</sub> a	1B 5B p <sub>1</sub> 61	27 91 p <sub>1</sub> 97

*p<sub>1</sub>* defines the print position and consists of a maximum of three digits. *p<sub>1</sub> = 0* and *p<sub>1</sub> = 1* define the first print position and thus have the same meaning.

### Absolute vertical positioning

Control sequence	Hexadecimal	Decimal
ESC [ p <sub>1</sub> d	1B 5B p <sub>1</sub> 64	27 91 p <sub>1</sub> 100

*p<sub>1</sub>* defines the print line and consists of a maximum of three digits. *p<sub>1</sub> = 0* and *p<sub>1</sub> = 1* define the first print line and thus have the same meaning.

### Relative vertical positioning

Control sequence	Hexadecimal	Decimal
ESC [ p <sub>1</sub> e	1B 5B p <sub>1</sub> 65	27 91 p <sub>1</sub> 101

*p<sub>1</sub>* defines the number of print lines and consists of a maximum of three digits. *p<sub>1</sub> = 0* and *p<sub>1</sub> = 1* define the first print line and thus have the same meaning.

## Font design

The following commands are available for font design:

- Select IBM character set 1
- Select IBM character set 2
- Set boldface mode
- Reset boldface mode
- Set double strike mode
- Reset double strike mode
- Set subscript/superscript mode
- Reset subscript/superscript mode
- Set expanded mode for one line
- Set/reset expanded mode
- Reset expanded mode
- Set character size and line spacing
- Set print quality and character pitch
- Set/reset underscore mode
- Set/reset overscore mode
- Additional commands

### Select IBM character set 1

Control sequence	Hexadecimal	Decimal
ESC 7	1B 37	27 55

In the initial condition the printer uses the character set specified in the menu.

## Select IBM character set 2

Control sequence	Hexadecimal	Decimal
ESC 6	1B 36	27 54

In the initial condition the printer uses the character set specified in the menu.

## Set boldface mode

Control sequence	Hexadecimal	Decimal
ESC E	1B 45	27 69

## Reset boldface mode

Control sequence	Hexadecimal	Decimal
ESC F	1B 46	27 70

## Set double strike mode

Control sequence	Hexadecimal	Decimal
ESC G	1B 47	27 71

## Reset double strike mode

Control sequence	Hexadecimal	Decimal
ESC H	1B 48	27 72

## Set subscript/superscript mode

Control sequence	Hexadecimal	Decimal
ESC S p <sub>1</sub>	1B 53 p <sub>1</sub>	27 83 p <sub>1</sub>

This command causes reduced-size characters to be superscripted (exponents) or subscripted (indices).

Superscripted characters (exponents) are printed approx.  $\frac{1}{2}$  line up. Subscripted characters (indices) are only reduced in size and printed on the base line.

p<sub>1</sub> defines subscript or superscript mode

Parameter values:

Dec	Hex	Meaning
0	00	Set superscript mode
1	01	Set subscript mode
48	30	Set superscript mode
49	31	Set subscript mode



The menu setting must be INDEX/EXPONENT (see [2]).

## Reset subscript/superscript mode

Control sequence	Hexadecimal	Decimal
ESC T	1B 54	27 84

## Set expanded mode for one line

Control sequence	Hexadecimal	Decimal
SO	0E	14

The characters in one line are printed with double width.

The function is terminated by *LF*, *CR*, *VT*, *FF*, *DC4* and *ESC W 0*.

## Set/reset expanded mode

Control sequence	Hexadecimal	Decimal
ESC W p <sub>1</sub>	1B 57 p <sub>1</sub>	27 87 p <sub>1</sub>

Characters are printed with double width when the expanded mode is active.

p<sub>1</sub> sets/resets the expanded mode

Parameter values:

Dec	Hex	Meaning
0	00	Reset expanded mode
1	01	Set expanded mode
48	30	Reset expanded mode
49	31	Set expanded mode

## Reset expanded mode

Control sequence	Hexadecimal	Decimal
DC4	14	20



This function only resets expanded mode set with the *SO* command.

## Set character size and line spacing

Control sequence	Hexadecimal	Decimal
ESC [ @ EOT NUL NUL NUL p <sub>1</sub> p <sub>2</sub>	1B 5B 40 04 00 00 00 p <sub>1</sub> p <sub>2</sub>	27 91 64 04 00 00 00 p <sub>1</sub> p <sub>2</sub>

This command defines the line spacing, the character height, and the character width.

p<sub>1</sub>      The left half-byte defines the line spacing and the right half-byte the character height. The left and right half-bytes must be added.

Valid parameter values for the left half-byte:

Dec	Hex	Meaning
00	00	No change of line spacing
16	10	Single character height line spacing
32	20	Double character height line spacing
48	30	Triple character height line spacing
64	40	Quadruple character height line spacing

Valid parameter values for the right half-byte:

Dec	Hex	Meaning
00	00	No change of character height
01	01	Single character height
02	02	Double character height
03	03	Triple character height
04	04	Quadruple character height

p<sub>2</sub>      defines the character width

Valid parameter values:

Dec	Hex	Meaning
00	00	No change of character width
01	01	Single character width
02	02	Double character width
03	03	Triple character width
04	04	Quadruple character width

## Set print quality and character pitch

Control sequence	Hexadecimal	Decimal
ESC I p <sub>1</sub>	1B 49 p <sub>1</sub>	27 73 p <sub>1</sub>

This command defines the print quality and the character pitch.

p<sub>1</sub> defines the print quality and the character pitch

Valid parameter values:

Dec	Hex	Meaning	
0	00	DRAFT quality;	10 cpi
1	01	DRAFT quality	proportional spacing
2	02	LQ/NLQ quality;	10 cpi
3	03	LQ/NLQ quality;	proportional spacing
8	08	DRAFT quality;	12 cpi
10	0A	LQ/NLQ quality;	12 cpi
16	10	DRAFT quality;	17.1 cpi
18	12	LQ/NLQ quality;	17.1 cpi

## Set/reset underscore mode

Control sequence	Hexadecimal	Decimal
ESC - p <sub>1</sub>	1B 2D p <sub>1</sub>	27 45 p <sub>1</sub>

The characters are underscored.

p<sub>1</sub> sets/resets the underscore mode

Valid parameter values:

Dec	Hex	Meaning
0	00	Reset underscore mode
1	01	Set underscore mode
48	30	Reset underscore mode
49	31	Set underscore mode

## Set/reset overscore mode

Control sequence	Hexadecimal	Decimal
ESC _ p <sub>1</sub>	1B 5F p <sub>1</sub>	27 95 p <sub>1</sub>

The characters are overscored.

p<sub>1</sub> sets/resets the overscore mode

Valid parameter values:

Dec	Hex	Meaning
0	00	Reset overscore mode
1	01	Set overscore mode
48	30	Reset overscore mode
49	31	Set overscore mode

## Additional commands

### Set graphic settings

Control sequence	Hexadecimal	Decimal
ESC [ p <sub>1</sub> m	1B 5 B p <sub>1</sub> 6D	27 91 p <sub>1</sub> 109

Valid values:

p<sub>1</sub> = 0 Normal presentation (all settings reset)

p<sub>1</sub> = 1  
Bold

p<sub>1</sub> = 3  
Italics

p<sub>1</sub> = 4  
Underscored

p<sub>1</sub> = 9  
Crossed out

p<sub>1</sub> = 20  
Double character width

p<sub>1</sub> = 21  
double underline

p<sub>1</sub> = 22  
Reset bold mode

p<sub>1</sub> = 23  
Reset italics mode

p<sub>1</sub> = 24  
Reset underscored mode

p<sub>1</sub> = 29  
Reset crossed-out mode

p<sub>1</sub> = 30 to 36  
Ignored

p<sub>1</sub> = 53  
Overscored

p<sub>1</sub> = 55  
Reset overscored mode

## Character repetition

Control sequence	Hexadecimal	Decimal
ESC [ p <sub>1</sub> b	1B 5B p <sub>1</sub> 62	27 91 p <sub>1</sub> 98

p<sub>1</sub> can be a maximum of three digits.

## Graphical change of sizes

Control sequence	Hexadecimal	Decimal
ESC [ p <sub>1</sub> ; p <sub>2</sub> SP B	1B 5B p <sub>1</sub> 3B p <sub>2</sub> 20 42	27 91 p <sub>1</sub> 59 p <sub>2</sub> 32 66

Valid values:

p<sub>1</sub> = 100 / p<sub>2</sub> = 100  
Normal height / normal width

p<sub>1</sub> = 200 / p<sub>2</sub> = 200  
Double height / Double width

p<sub>1</sub> = 300 / p<sub>2</sub> = 300  
Triple height / Triple width

p<sub>1</sub> = 400 / p<sub>2</sub> = 400  
Quadruple height / Quadruple width

p<sub>1</sub> and p<sub>2</sub> max. = 800 (in steps of 100)

Graphical change of size for DATA LARGE:

p<sub>1</sub> = 100 / p<sub>2</sub> = 100  
Normal height / normal width  
p<sub>1</sub> and p<sub>2</sub> max. = 9900 (in steps of 100)

**Set national version and code page**

Control sequence	Hexadecimal	Decimal
ESC [ p <sub>1</sub> ; p <sub>2</sub> w	1B 5B p <sub>1</sub> 3B p <sub>2</sub> 77	27 91 p <sub>1</sub> 59 p <sub>2</sub> 119

p<sub>1</sub> = 1 to 15

For national versions or code pages

p1 für IBM SET 2:

p<sub>1</sub> = 1 : U.S.A  
p<sub>1</sub> = 2 : France  
p<sub>1</sub> = 3 : Germany  
p<sub>1</sub> = 4 : U.K.  
p<sub>1</sub> = 5 : Denmark 1  
p<sub>1</sub> = 6 : Sweden  
p<sub>1</sub> = 7 : Italy  
p<sub>1</sub> = 8 : Spain 1  
p<sub>1</sub> = 9 : Japan  
p<sub>1</sub> = 10 : Norway  
p<sub>1</sub> = 11 : Denmark 2  
p<sub>1</sub> = 12 : Spain 2  
p<sub>1</sub> = 13 : Latin AM  
p<sub>1</sub> = 14 : Turkey

p1 for IBM CODE PAGE:

p<sub>1</sub> = 1 : PAGE 437  
p<sub>1</sub> = 2 : PAGE 850  
p<sub>1</sub> = 3 : PAGE 860  
p<sub>1</sub> = 4 : PAGE 863  
p<sub>1</sub> = 5 : PAGE 865  
p<sub>1</sub> = 6 : PAGE 858 (Euro-character)

$p_2 = d_3 \ d_2 \ d_1$  (three digits)

0	6	1	IBM set 1
0	6	2	IBM set 2
0	6	3	IBM code page
0	7	1	Epson EXT GCT

**Set national version**

Control sequence	Hexadecimal	Decimal
ESC [ p <sub>1</sub> w	1B 5B p <sub>1</sub> 77	27 91 p <sub>1</sub> 119

See the command “[Set/reset overscore mode](#)” for the setting of  $p_1$ .

**Set code page**

Control sequence	Hexadecimal	Decimal
ESC [ ; p <sub>2</sub> w	1B 5B 3B p <sub>2</sub> 77	27 91 59 p <sub>2</sub> 119

See the command “[Set/reset overscore mode](#)” for the setting of  $p_2$ .

**Set character pitch and select font**

Control sequence	Hexadecimal	Decimal
ESC [ p <sub>1</sub> ; p <sub>2</sub> x	1B 5B p <sub>1</sub> 3B p <sub>2</sub> 78	27 91 p <sub>1</sub> 59 p <sub>2</sub> 120

$p_1 = 1$   
Data

$p_1 = 2$   
Roman

$p_1 = 3$   
Sans Serif

$p_1 = 4$   
Courier

$p_1 = 5$   
Prestige

$p_1 = 6$   
Script

$p_1 = 7$   
OCR-B

$p_1 = 8$   
OCR-A

$p_1 = 9$   
Orator-C

$p_1 = 10$   
Orator

$p_1 = 11$   
Data Block

$p_1 = 12$   
Data Large

$p_2 = 1$   
10 cpi

$p_2 = 2$   
12 cpi

$p_2 = 3$   
15 cpi

$p_2 = 4$   
Proportional

$p_2 = 5$   
Proportional

$p_2 = 6$   
14.4 cpi

$p_2 = 7$   
18 cpi

$p_2 = 8$   
17.1 cpi

$p_2 = 9$   
20 cpi

**Select font**

Control sequence	Hexadecimal	Decimal
ESC [ p <sub>1</sub> x	1B 5B p <sub>1</sub> 78	27 91 p <sub>1</sub> 120

See the command “[Set character pitch and select font](#)” for the setting of *p<sub>1</sub>*.

**Set print quality (NLQ, LQ)**

Control sequence	Hexadecimal	Decimal
ESC [ p <sub>1</sub> SP X	1B 5B p <sub>1</sub> 20 58	27 91 p <sub>1</sub> 32 88

p<sub>1</sub> = 0  
LQ

p<sub>1</sub> = 1  
NLQ

This is only valid if the NLQ type style is available.

## Bitmap graphics

The following commands are available:

- Select graphics mode
- Select single dot-density graphics mode
- Select double dot-density graphics mode
- Select double dot-density and double-speed graphics mode
- Select quadruple dot-density graphics mode
- Select graphics mode (expanded)

### Select graphics mode

Control sequence	Hexadecimal	Decimal
ESC * p <sub>1</sub> p <sub>2</sub> p <sub>3</sub> data	1B 2A p <sub>1</sub> p <sub>2</sub> p <sub>3</sub> data	27 42 p <sub>1</sub> p <sub>2</sub> p <sub>3</sub> data

The graphics data is transferred in columns. A column contains either 8 or 24 individual vertical dots.

Each graphics line begins with this command, which defines the graphics mode (vertical and horizontal resolution). A defined number of pixel data items follows. The number of columns is defined by parameters  $p_2$  and  $p_3$ .

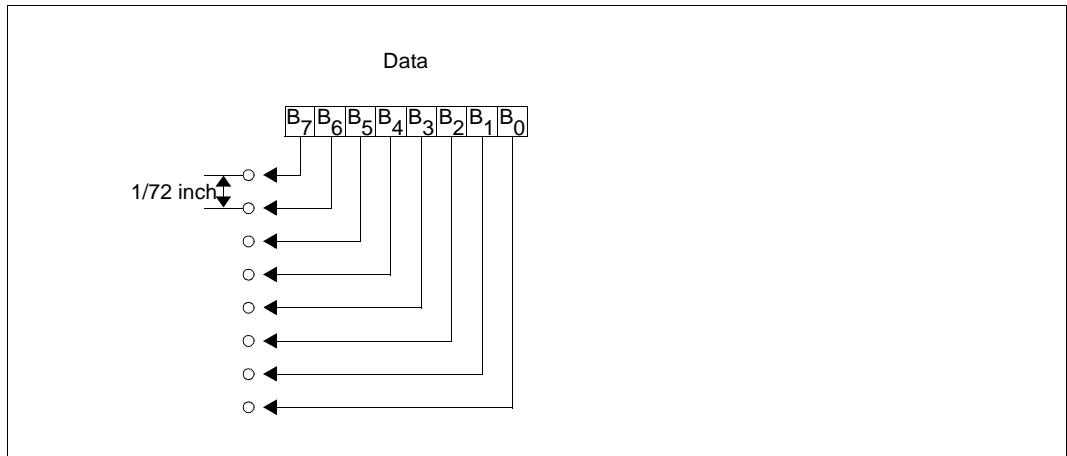


Figure 1: Vertical dot density 72 dpi

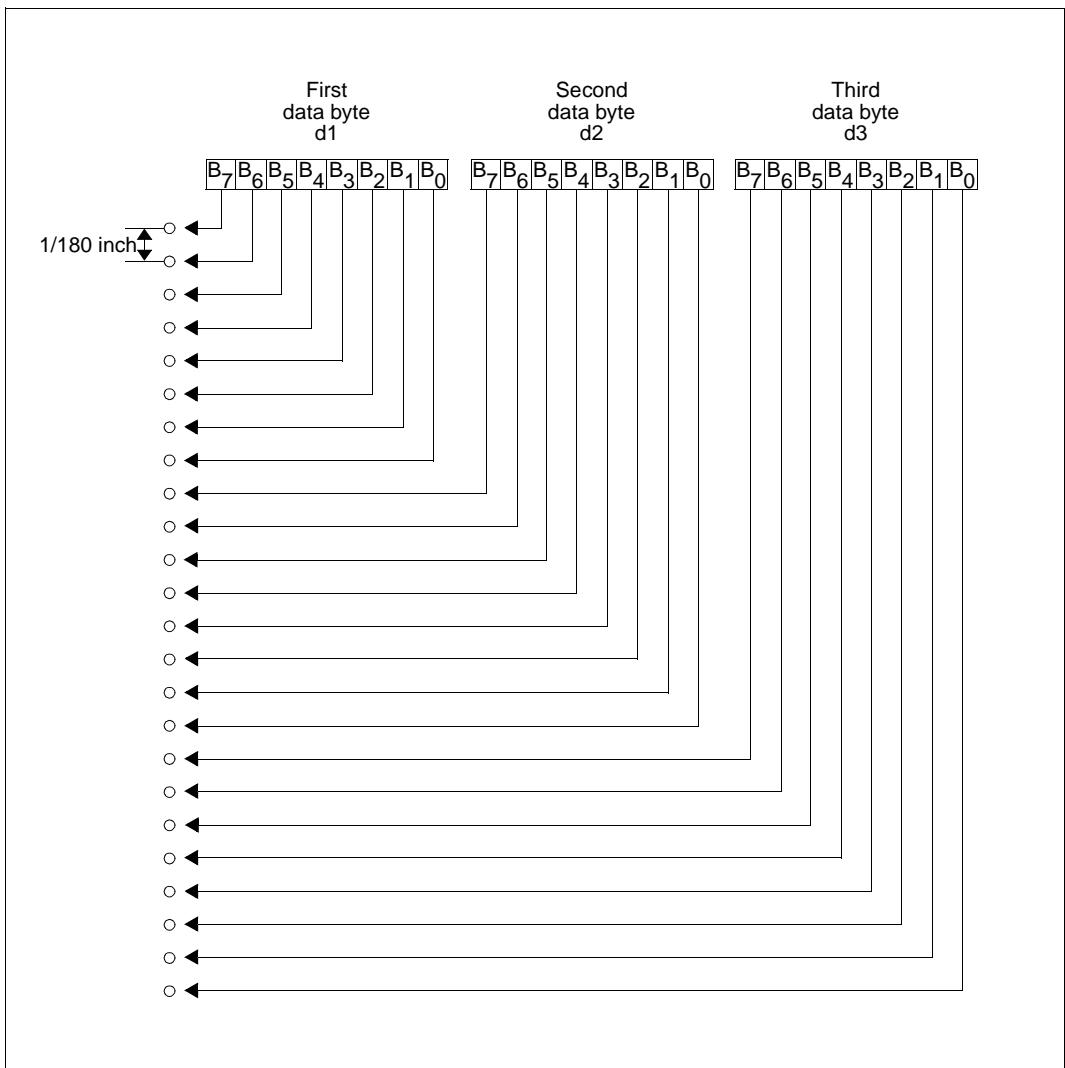


Figure 2: Vertical dot density 180 dpi

p<sub>1</sub> defines the graphics mode

Valid parameter values:

Dec	Hex	Mode	Number of needles	dpi		Compatible commands
				hori- zontal	verti- cal	
0	00	Single density	8	60	72	ESC K
1	01	Double density	8	120	72	ESC L
2	02	Double density and high speed <sup>1)</sup>	8	120	72	ESC Y
3	03	Quadruple density <sup>1)</sup>	8	240	72	ESC Z
4	04	CRT 1	8	80	72	
5	05	Plotter	8	72	72	
6	06	CRT 2	8	90	72	
11	0B	Double density Plotter <sup>1)</sup>	8	144	72	
32	20	Single density	24	60	180	
33	21	Double density	24	120	180	
38	26	CRT 3	24	90	180	
39	27	Triple density	24	180	180	
40	28	Sixfold density <sup>1)</sup>	24	360	180	

<sup>1)</sup> In this mode, printing in adjacent columns is not possible.

p<sub>2</sub> p<sub>3</sub> define the number of columns

$$\text{Number of columns} = p_2 + (p_3 * 256)$$

Data Data bytes containing the dot information

## Select single dot-density graphics mode

Control sequence	Hexadecimal	Decimal
ESC K p <sub>1</sub> p <sub>2</sub> data	1B 4B p <sub>1</sub> p <sub>2</sub> data	27 75 p <sub>1</sub> p <sub>2</sub> data

The graphics data is transferred in columns. A column contains 8 individual vertical dots (see [Select graphics mode](#)).

This command causes a graphics line to be printed.

The horizontal resolution is 60 dpi and the vertical resolution is 72 dpi.

p<sub>1</sub> p<sub>2</sub> define the number of columns

$$\text{Number of columns} = p_1 + (p_2 * 256)$$

Data Data bytes containing the dot information

## Select double dot-density graphics mode

Control sequence	Hexadecimal	Decimal
ESC L p <sub>1</sub> p <sub>2</sub> data	1B 4C p <sub>1</sub> p <sub>2</sub> data	27 76 p <sub>1</sub> p <sub>2</sub> data

The graphics data is transferred in columns. A column contains 8 individual vertical dots (see [Select graphics mode](#)).

This command causes a graphics line to be printed.

The horizontal resolution is 120 dpi and the vertical resolution is 72 dpi.

p<sub>1</sub> p<sub>2</sub> define the number of columns

$$\text{Number of columns} = p_1 + (p_2 * 256)$$

Data Data bytes containing the dot information

## Select double dot-density and double-speed graphics mode

Control sequence	Hexadecimal	Decimal
ESC Y p <sub>1</sub> p <sub>2</sub> data	1B 59 p <sub>1</sub> p <sub>2</sub> data	27 89 p <sub>1</sub> p <sub>2</sub> data

The graphics data is transferred in columns. A column contains 8 individual vertical dots (see [Select graphics mode](#)).

This command causes a graphics line to be printed with double speed.

The horizontal resolution is 120 dpi and the vertical resolution is 72 dpi.

p<sub>1</sub> p<sub>2</sub>      define the number of columns

$$\text{Number of columns} = p_1 + (p_2 * 256)$$

Data      Data bytes containing the dot information



In this mode, printing in adjacent columns is not possible.

## Select quadruple dot-density graphics mode

Control sequence	Hexadecimal	Decimal
ESC Z p <sub>1</sub> p <sub>2</sub> data	1B 5A p <sub>1</sub> p <sub>2</sub> data	27 90 p <sub>1</sub> p <sub>2</sub> data

The graphics data is transferred in columns. A column contains 8 individual vertical dots (see [Select graphics mode](#)).

This command causes a graphics line to be printed.

The horizontal resolution is 240 dpi and the vertical resolution is 72 dpi.

p<sub>1</sub> p<sub>2</sub>      define the number of columns

$$\text{Number of columns} = p_1 + (p_2 * 256)$$

Data      Data bytes containing the dot information



In this mode, printing in adjacent columns is not possible.

## Select graphics mode (expanded)

Control sequence	Hexadecimal	Decimal
ESC [ g p <sub>1</sub> p <sub>2</sub> p <sub>3</sub> data	1B 5B 67 p <sub>1</sub> p <sub>2</sub> p <sub>3</sub> data	27 91 103 p <sub>1</sub> p <sub>2</sub> p <sub>3</sub> data

The graphics data is transferred in columns. A column contains either 8 or 24 individual vertical dots.

Each graphics line begins with this command.  $p_1$  and  $p_2$  define the amount of graphics data. The definition of the graphics mode with  $p_3$  (vertical and horizontal resolution) follows.

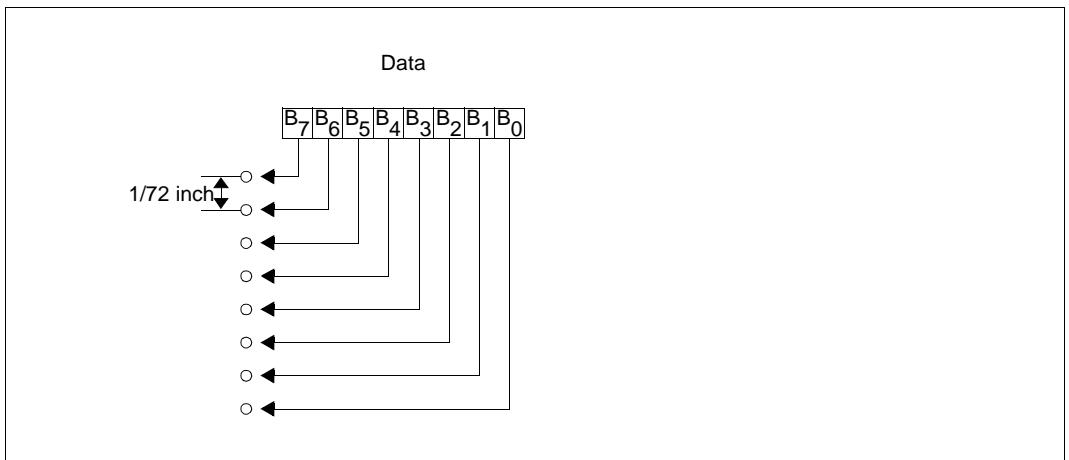


Figure 3: Vertical dot density 72 dpi

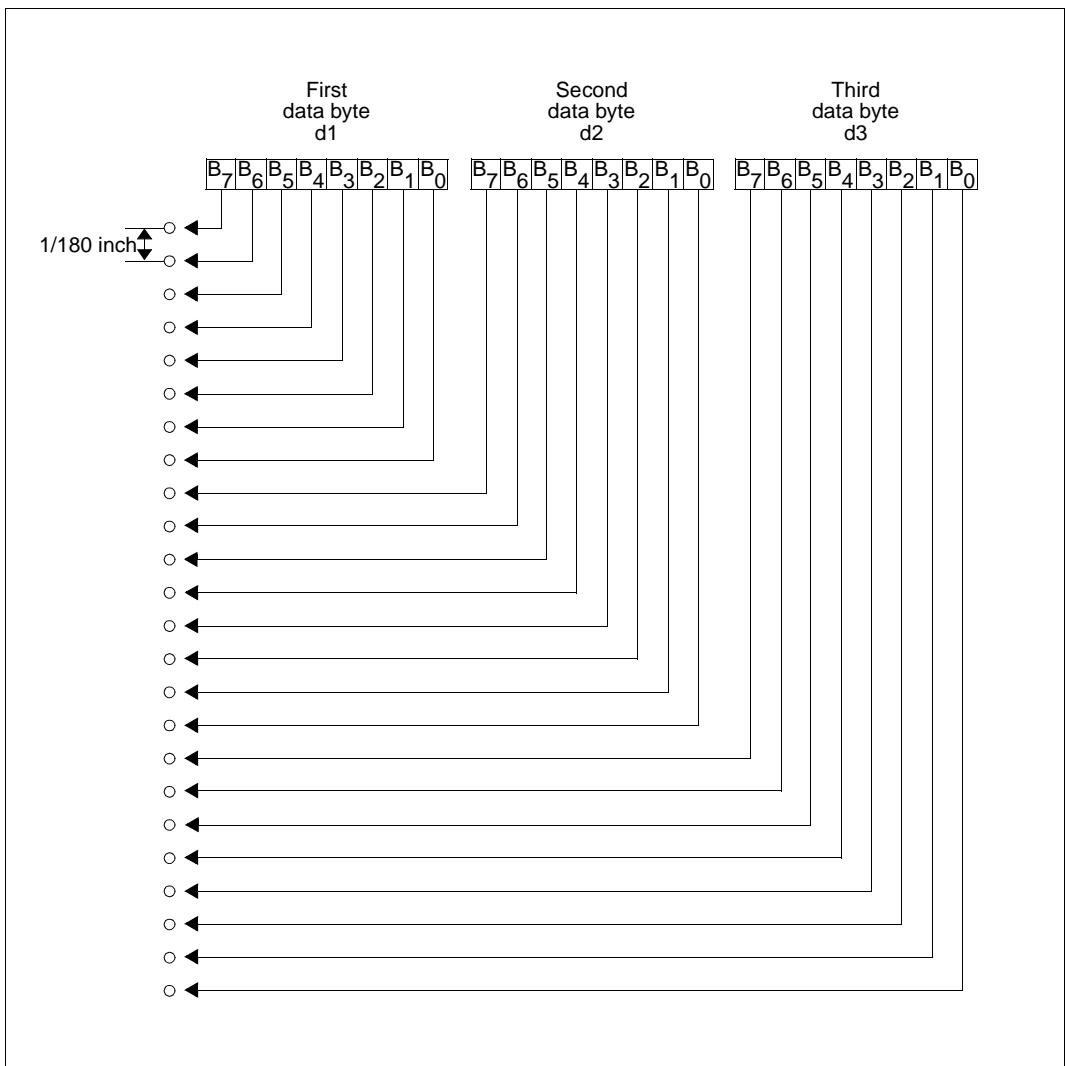


Figure 4: Vertical dot density 180 dpi

**p<sub>1</sub> p<sub>2</sub>** define the number of graphics data bytes + 1

Number of graphics data bytes = p<sub>1</sub> + (p<sub>2</sub> \* 256) \* number of bytes/column

**p<sub>3</sub>** defines the graphics mode

Valid parameter values:

<b>Dec</b>	<b>Hex</b>	<b>Mode</b>	<b>Number of needles</b>	<b>dpi</b>		<b>Compatible commands</b>
				<b>hori- zontal</b>	<b>verti- cal</b>	
0	00	Single density	8	60	72	<i>ESC K</i>
1	01	Double density	8	120	72	<i>ESC L</i>
2	02	Double density and high speed <sup>1)</sup>	8	120	72	<i>ESC Y</i>
3	03	Quadruple density <sup>1)</sup>	8	240	72	<i>ESC Z</i>
08	08	Single density	24	60	180	
09	09	Double density	24	120	180	
11	0B	Triple density	24	180	180	
12	0C	Sixfold density <sup>1)</sup>	24	360	180	

<sup>1)</sup> In this mode, printing in adjacent columns is not possible.

**Data** Data bytes containing the dot information

## Miscellaneous commands

- Set default tab stops
- Transparent print data for one character
- Transparent print data for several characters
- Automatic line feed
- Set printer online
- Set printer offline
- Clear line buffer
- Delete character
- NUL function
- Additional commands

### Set default tab stops

Control sequence	Hexadecimal	Decimal
ESC R	1B 52	27 82

This command causes a horizontal tab stop to be set in every eighth column.

All set vertical tab stops are reset.

### Transparent print data for one character

Control sequence	Hexadecimal	Decimal
ESC ^ p1	1B 5E p1	27 94 p1

The character in the specified code location is printed. Characters defined as non-printing characters can also be printed (e.g. characters between X'00 and X'20).

Every transparent print data byte is interpreted as an individual character code. If no character is defined for a character code, a space is printed.

## Transparent print data for several characters

Control sequence	Hexadecimal	Decimal
ESC \ p <sub>1</sub> p <sub>2</sub>	1B 5C p <sub>1</sub> p <sub>2</sub>	27 92 p <sub>1</sub> p <sub>2</sub>

This command enables printing the characters in all code locations. Characters defined as non-printing characters can also be printed (e.g. characters between X'00 and X'20).

Every transparent print data byte is interpreted as an individual character code. If no character is defined for a character code, a space is printed.

p<sub>1</sub> p<sub>2</sub> define the number of transparent print data bytes

$$\text{Number} = (p_1 + (p_2 * 256))$$

## Automatic line feed

Control sequence	Hexadecimal	Decimal
ESC 5 p <sub>1</sub>	1B 35 p <sub>1</sub>	27 53 p <sub>1</sub>

This command sets/resets the automatic line feed function.

p<sub>1</sub> Automatic line feed

Valid parameter values:

Dec	Hex	Meaning	
0	00	Reset	(CR = CR)
1	01	Set	(CR = CR + LF)
48	30	Reset	(CR = CR)
49	31	Set	(CR = CR + LF)

## Set printer online

Control character	Hexadecimal	Decimal
DC1	11	17

Sets an offline printer online.



The command is ineffective if the printer was set offline with the ONLINE button.

## Set printer offline

Control sequence	Hexadecimal	Decimal
ESC Q #	1B 51 23	27 81 35
ESC Q \$	1B 51 24	27 81 36

Sets the printer offline. All following data is ignored except for the *Set printer online* command.

## Clear line buffer

Control character	Hexadecimal	Decimal
CAN	18	24

Clears the whole contents of the line buffer.

## Delete character

Control character	Hexadecimal	Decimal
DEL	7F	127

Deletes the character received last.

## NUL function

Control character	Hexadecimal	Decimal
NUL	00	00

This control character has no effect.

## Additional commands

### Command replacement \$\$

Control sequence	Hexadecimal	Decimal
\$\$	24 24	36 36

This command replaces the control sequence *ESC* /, hexadecimal 1B 5B, decimal 27 91.

### Command replacement \$\$/

Control sequence	Hexadecimal	Decimal
\$\$/	24 24 2F	36 36 47

This command replaces the control sequence *ESC*, hexadecimal 1B, decimal 27.

## Macro selection

Control sequence	Hexadecimal	Decimal
ESC [ p <sub>1</sub> ; p <sub>2</sub> SP r	1B 5B p <sub>1</sub> 3B p <sub>2</sub> 20 72	27 91 p <sub>1</sub> 59 p <sub>2</sub> 32 114

p<sub>1</sub> can have the values 1 to 4.

p<sub>2</sub> selects the emulation.

p<sub>2</sub> = 2  
IBM Proprinter

p<sub>2</sub> = 3  
IBM Proprinter, AGM

p<sub>2</sub> = 4  
Epson LQ-2550

## Alternative graphics mode AGM

The alternative graphics mode can be selected in the menu (see [2]).

In the alternative graphics mode, the functions of the commands described below change:

- Set  $n/60$  inch line spacing mode
- Set  $n/216$  or  $n/180$  inch line spacing mode
- Relative vertical tabulation forward
- Select graphics mode

### Set $n/60$ inch line spacing mode

Control sequence	Hexadecimal	Decimal
ESC A p <sub>1</sub>	1B 41 p <sub>1</sub>	27 65 p <sub>1</sub>

A line spacing of  $n/60$  is set. The defined line spacing is activated directly in the AGM mode.

p<sub>1</sub>      sets the  $n/60$  inch line spacing mode

Range:            X'01 ≤ p<sub>1</sub> ≤ X'55

### Set $n/216$ or $n/180$ inch line spacing mode

Control sequence	Hexadecimal	Decimal
ESC 3 p <sub>1</sub>	1B 33 p <sub>1</sub>	27 51 p <sub>1</sub>

A line spacing of  $n/216$  or  $n/180$  inch is set depending on the line spacing unit (see [table "Set line spacing unit"](#)).

The AGM mode default is  $n/180$  inch.

p<sub>1</sub>      Line spacing in  $n/216$  or  $n/180$  inch increments

Range:            X'01 ≤ p<sub>1</sub> ≤ X'FF

## Relative vertical tabulation forward

Control sequence	Hexadecimal	Decimal
ESC J p <sub>1</sub>	1B 4A p <sub>1</sub>	27 74 p <sub>1</sub>

The vertical print position is moved down  $\frac{n}{216}$  or  $\frac{n}{180}$  inch depending on the line spacing unit (see [Set line spacing unit](#)).

The AGM mode default is  $\frac{n}{180}$  inch.

p<sub>1</sub>      Relative vertical shift in  $\frac{n}{216}$  or  $\frac{n}{180}$  inch increments

Range:            X'00 ≤ p<sub>1</sub> ≤ X'FF

## Select graphics mode

Control sequence	Hexadecimal	Decimal
ESC * p1 p2 p3 data	1B 2A p1 p2 p3 data	27 42 p1 p2 p3 data

The graphics data is transferred in columns. A column contains either 8 or 24 individual vertical dots.

Each graphics line begins with the command that defines the graphics mode (vertical and horizontal resolution). A defined number of pixel items follows. The number of columns is defined by parameters  $p_2$  and  $p_3$ .

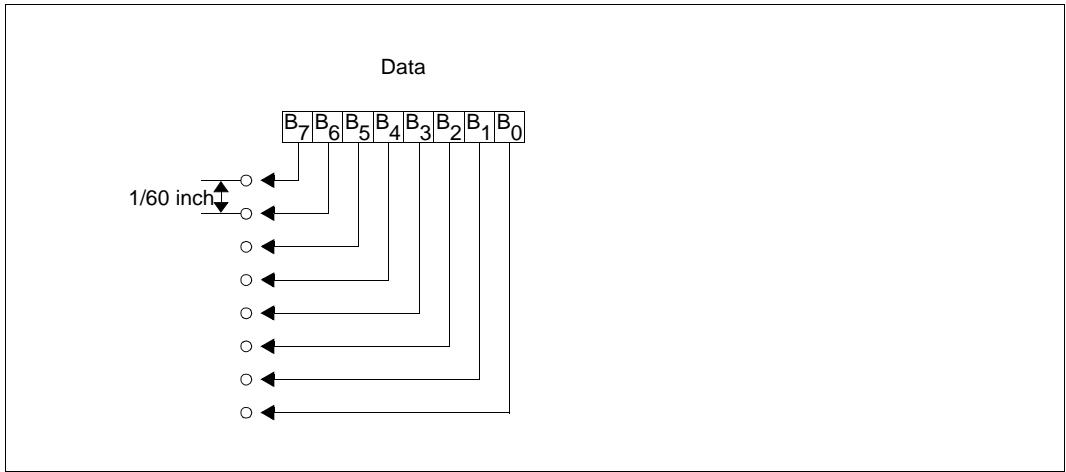


Figure 5: Vertical dot density 60 dpi

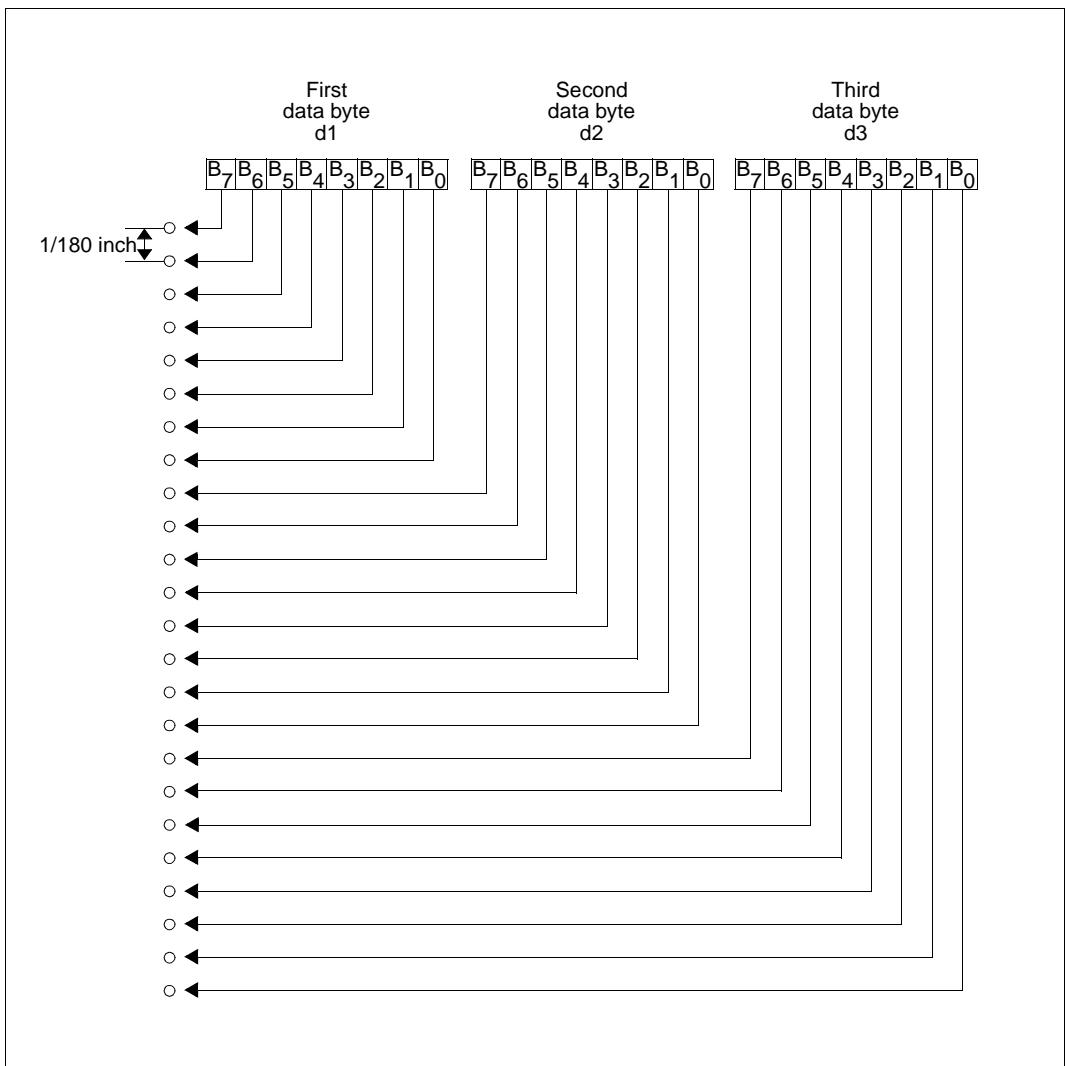


Figure 6: Vertical dot density 180 dpi

p<sub>1</sub> defines the graphics mode

Valid parameter values:

Dec	Hex	Meaning	Number of needles	dpi		Compatible commands
				hori- zontal	verti- cal	
0	00	Single density	8	60	60	<i>ESC K</i>
1	01	Double density	8	120	60	<i>ESC L</i>
2	02	Double density and high speed <sup>1)</sup>	8	120	60	<i>ESC Y</i>
3	03	Quadruple density <sup>1)</sup>	8	240	60	<i>ESC Z</i>
4	04	CRT 1	8	80	60	
6	06	CRT 2	8	90	60	
32	20	Single density	24	60	180	
33	21	Double density	24	120	180	
38	26	CRT 3	24	90	180	
39	27	Triple density	24	180	180	
40	28	Sixfold density <sup>1)</sup>	24	360	180	

<sup>1)</sup> In this mode, printing in adjacent columns is not possible.

p<sub>2</sub> p<sub>3</sub> define the number of columns

$$\text{Number of columns} = p_2 + (p_3 * 256)$$

Data Data bytes containing the dot information

---

## Description of the Epson LQ-2550 emulation

With the Epson LQ-2550 emulation, the 9014, 9015, 9015 E and 9016 printers behave like the Epson LQ-2550.

The commands are divided into the following command groups:

- Initial condition
- Forms transport mechanism
- Forms layout
- Forms transport
- Print carriage movements
- Font design
- Bitmap graphics
- Miscellaneous commands
- ESC / P2 commands

## Initial condition

After power-on, the printer is in the following initial condition:

- Printer buffer cleared
- Tab stops in all vertical tabulation channels reset
- Vertical tabulation channel 0 selected
- Proportional spacing mode reset
- Character spacing zero
- Horizontal tab stops set in every eighth column
- Print direction bidirectional
- Text left-justified
- User-defined character set inactive and cleared
- Normal character style
- Italics mode off
- Boldface mode off
- Double strike mode off
- Subscript/superscript mode off
- Condensed mode off
- Expanded mode off
- Normal character height
- Underscore mode off
- Line marking mode off
- Character enlargement mode off
- Reassign graphics mode off
- Delete MSB default

The following functions depend on the menu setting:

- Form length
- Perforation skip mode
- Left margin
- Right margin
- Line spacing
- Font (type style)
- Print quality (DRAFT, LQ, NLQ)
- Character set
- National version
- Character pitch
- Paper source

## Reset to initial condition

Control sequence	Hexadecimal	Decimal
ESC @	1B 40	27 64

This command sets the printer to the initial condition.

The user-defined character set is not reset by this command.

## Forms transport mechanism

The printer is always equipped with two continuous forms tractors. The last sheet of a continuous forms stack can be printed on up to the end of the form.

The capability of the printer to feed paper from different sources is optimally supplemented by the option that automatically adjusts the distance between the print head and the print platen.

### Select single form feed

Control sequence	Hexadecimal	Decimal
ESC EM p <sub>1</sub>	1B 19 p <sub>1</sub>	27 25 p <sub>1</sub>

**i** This control character is only available for the 9014 and 9016 printers, because the other printers don't have the equipment for single form feed.

- **9014 printer:**

EM=19  
Form feed

p<sub>1</sub>= 1  
ASF, bin 1 or 2

p<sub>1</sub>= 2  
ASF, bin 2 or 3

p<sub>1</sub>= 3  
ASF, bin 1 or 2 or 3

p1 = 82 or R: (52)  
eject sheet

- **9016 printer**

EM=19  
Form feed

p1 = 82 or R: (52)  
eject sheet

## Additional commands

### Eject sheet

Control sequence	Hexadecimal	Decimal
ESC [ < s	1B 5B 3C 73	27 91 60 115

This command causes a vertical form feed to the beginning of the next page.

### Select paper source and ejection, number of copies, cut-off mode

(SPS or SPSIF)

Control sequence	Hexadecimal	Decimal
ESC [ > p <sub>1</sub> ; p <sub>2</sub> ; p <sub>3</sub> ; p <sub>4</sub> s	1B 5B 3E p <sub>1</sub> 3B p <sub>2</sub> 3B p <sub>3</sub> 3B p <sub>4</sub> 73	27 91 62 p <sub>1</sub> 59 p <sub>2</sub> 59 p <sub>3</sub> 59 p <sub>4</sub> 115

- i** The control character > should only be used if an indent or a form feed (FF) is to be performed.
- i** p<sub>4</sub>= 0 to 1 is only available for the 9015 printer with cut-off feature.

- **9014 printer**

p<sub>1</sub>= 0

Manual single form feed

p<sub>1</sub>=1 to 3

ASF, bin 1 to 3

p<sub>1</sub>= 6

Ignored

p<sub>1</sub>= 7

Tractor

p<sub>1</sub>= 8

ASF, bin 1 or 2

p<sub>1</sub>= 9

ASF, bin 2 or 3

$p_1 = 10$   
ASF, bin 1 or 2 or 3

$p_2 = 0$   
AGC = automatic gap control

$p_2 = 1$  to  $6$   
PCC = programmable copy control  
(Print gap for 1- to 6-ply copies)

$p_3 = 0$   
Cut-off sheets in upper tray

$p_3 = 1$   
Paper exit front side (confirmed by start/stop key)

$p_3 = 2$   
Paper exit front side, (not confirmed by start/stop key, but controlled by application)

$p_3 = 3$   
Batch output (rear side)

- **9015 printer**

$p_1 = 0$  to 3

Ignored

$p_1 = 6$

Upper tractor

$p_1 = 7$

Lower tractor

$p_1 = 8$  to 10

Ignored

$p_1 = 15$

Selection of both tractors (upper and lower)

$p_2 = 0$

AGC (automatic gap control)

$p_2 = 1$  to 6

PCC (programmable copy control)

$p_3 = 0$

Cut-off sheets in upper tray

$p_3 = 1$

Ignored

$p_3 = 2$

Ignored

$p_3 = 3$

Sheets in stack (default)

$p_4 = 0$

Cut-off feature off (default)

$p_4 = 1$

Cut-off feature on

- **9015 E printer**

$p_1 = 0$

Manual single form feed

$p_1 = 1$  to  $3$

Ignored

$p_1 = 6$

Upper tractor

$p_1 = 7$

Lower tractor

$p_1 = 8$  to  $10$

Ignored

$p_1 = 15$

Selection of both tractors (upper and lower)

$p_2 = 0$

AGC = automatic gap control

$p_2 = 1$  to  $6$

PCC = programmable copy control  
(Print gap for 1- to 6-ply copies)

$p_3 = 0$

Ignored

$p_3 = 1$

Paper exit front side (confirmed by start/stop key)

$p_3 = 2$

Paper exit front side, (not confirmed by start/stop key, but controlled by application)

$p_3 = 3$

Batch output (rear side)

- **9016 printer**

$p_1 = 0$   
Manual single form feed

$p_1 = 1$  bis 3  
Ignored

$p_1 = 6$   
Ignored

$p_1 = 7$   
Lower Tractor

$p_1 = 8$  bis 10  
Ignored

$p_1 = 15$   
Ignored

$p_2 = 0$   
AGC = automatic gap control

$p_2 = 1$  to 6  
PCC = programmable copy control  
(Print gap for 1- to 6-ply copies)

$p_3 = 0$   
Ignored

$p_3 = 1$   
Paper exit front side (confirmed by start/stop key)

$p_3 = 2$   
Paper exit front side, (not confirmed by start/stop key, but controlled by application)

$p_3 = 3$   
Ignored

## Forms layout

The dimensions of a form can be selected freely. The following commands are available:

- Set form length in lines
- Set form length in inches
- Set perforation skip mode
- Reset perforation skip mode
- Set left margin
- Set right margin

### Set form length in lines

Control sequence	Hexadecimal	Decimal
ESC C p <sub>1</sub>	1B 43 p <sub>1</sub>	27 67 p <sub>1</sub>

This command specifies the physical form length in multiples of the current line spacing and sets the current vertical position as the first print line (top of form).

The set form length is not affected by later changes of the line spacing.

p<sub>1</sub>      Form length in multiples of the current line spacing

Range:            X'01 ≤ p<sub>1</sub> ≤ X'7F  
The minimum form length is 3 inches and the maximum form length is 22 inches.

## Set form length in inches

Control sequence	Hexadecimal	Decimal
ESC C NUL p <sub>1</sub>	1B 43 00 p <sub>1</sub>	27 67 00 p <sub>1</sub>

This command specifies the physical form length in inches and sets the current vertical position as the first print line (top of form).

p<sub>1</sub> Form length in inches

Range: X'01 ≤ p<sub>1</sub> ≤ X'16

The minimum form length is 3 inches and the maximum form length is 22 inches.

## Set perforation skip mode

Control sequence	Hexadecimal	Decimal
ESC N p <sub>1</sub>	1B 4E p <sub>1</sub>	27 78 p <sub>1</sub>

The perforation area is specified in number of lines at the current line spacing.

The perforation area is not changed by later changes of the line spacing. It is skipped at the end of every page.

The perforation area must be selected so that at least  $\frac{4}{6}$  inch remain as print area.

The perforation skip mode is reset by changing the form length or by the *Reset perforation skip mode* command.

p<sub>1</sub> Perforation area in lines at the current line spacing

Range: X'01 ≤ p<sub>1</sub> ≤ X'7F

## Reset perforation skip mode

Control sequence	Hexadecimal	Decimal
ESC O	1B 4F	27 79

The perforation skip mode is reset.

## Set left margin

Control sequence	Hexadecimal	Decimal
ESC I p <sub>1</sub>	1B 6C p <sub>1</sub>	27 108 p <sub>1</sub>

The left margin is set to the right edge of the specified column.

The first column of a line is column 1. The set left margin is not affected by later changes of the character pitch. The left margin must be selected so that at least  $\frac{4}{10}$  inch remain as print area between the left and right margins.

This command must be located at the beginning of the line.

p<sub>1</sub>      Left margin in columns at the current character pitch

Range:            X'00 ≤ p<sub>1</sub> ≤ X'FC

## Set right margin

Control sequence	Hexadecimal	Decimal
ESC Q p <sub>1</sub>	1B 51 p <sub>1</sub>	27 81 p <sub>1</sub>

The right margin is set to the right edge of the specified column.

The first column of a line is column 1. The set right margin is not affected by later changes of the character pitch. The right margin must be selected so that at least  $\frac{4}{10}$  inch remain as print area between the left and right margins.

This command must be located at the beginning of the line.

p<sub>1</sub>      Right margin in columns at the current character pitch

Range:            X'04 ≤ p<sub>1</sub> ≤ X'FF

## Forms transport

The following commands affect paper movements:

- Set 8 lpi
- Set 6 lpi
- Set  $n/60$  inch line spacing mode
- Set  $n/180$  inch line spacing mode
- Set  $n/360$  inch line spacing mode
- Line feed (LF)
- Form feed (FF)
- Relative vertical tabulation forward
- Relative vertical tabulation reverse
- Select vertical tabulation channel
- Set vertical tab stops
- Set vertical tab stops in channel
- Vertical tabulation

### Set 8 lpi

Control sequence	Hexadecimal	Decimal
ESC 0	1B 30	27 48

The line spacing is set to 8 lines per inch.

### Set 6 lpi

Control sequence	Hexadecimal	Decimal
ESC 2	1B 32	27 50

The line spacing is set to 6 lines per inch.

## Set n/60 inch line spacing mode

Control sequence	Hexadecimal	Decimal
ESC A p <sub>1</sub>	1B 41 p <sub>1</sub>	27 65 p <sub>1</sub>

The line spacing is set to  $n/60$  inch.

p<sub>1</sub> Line spacing in  $1/60$  inch increments

Range: X'00 ≤ p<sub>1</sub> ≤ X'7F

## Set n/180 inch line spacing mode

Control sequence	Hexadecimal	Decimal
ESC 3 p <sub>1</sub>	1B 33 p <sub>1</sub>	27 51 p <sub>1</sub>

The line spacing is set to  $n/180$  inch.

p<sub>1</sub> Line spacing in  $1/180$  inch increments

Range: X'00 ≤ p<sub>1</sub> ≤ X'FF

## Set n/360 inch line spacing mode

Control sequence	Hexadecimal	Decimal
ESC + p <sub>1</sub>	1B 2B p <sub>1</sub>	27 43 p <sub>1</sub>

The line spacing is set to  $n/360$  inch.

p<sub>1</sub> Line spacing in  $1/360$  inch increments

Range: X'00 ≤ p<sub>1</sub> ≤ X'FF

## Line feed (LF)

Control character	Hexadecimal	Decimal
LF	0A	10

The line feed is performed using the current line spacing. The contents of the line buffer are printed.

The expanded mode for one line is terminated by this control character.



A carriage return is also performed depending on the menu setting.

## Form feed (FF)

Control character	Hexadecimal	Decimal
FF	0C	12

The paper is advanced to the next top of form position. The contents of the line buffer are printed.

The expanded mode for one line is terminated by this control character.



A carriage return is also performed depending on the menu setting.

## Relative vertical tabulation forward

Control sequence	Hexadecimal	Decimal
ESC J p <sub>1</sub>	1B 4A p <sub>1</sub>	27 74 p <sub>1</sub>

The vertical print position is moved down in  $n/180$  inch increments.

p<sub>1</sub>      Relative vertical movement in  $n/180$  inch increments

Range:            X'00 ≤ p<sub>1</sub> ≤ X'FF

## Relative vertical tabulation reverse

Control sequence	Hexadecimal	Decimal
ESC j p <sub>1</sub>	1B 6A p <sub>1</sub>	27 106 p <sub>1</sub>

The vertical print position is moved up in  $n/180$  inch increments.

p<sub>1</sub>      Relative vertical movement in  $n/180$  inch increments

Range:            X'00 ≤ p<sub>1</sub> ≤ X'FF

## Select vertical tabulation channel

Control sequence	Hexadecimal	Decimal
ESC / p <sub>1</sub>	1B 2F p <sub>1</sub>	27 47 p <sub>1</sub>

This command selects the vertical tabulation channel that contains the vertical tab stops used by the *Vertical tabulation* command.

p<sub>1</sub>      Number of the vertical tabulation channel

Range:            X'00 ≤ p<sub>1</sub> ≤ X'07

## Set vertical tab stops

Control sequence	Hexadecimal	Decimal
ESC B p <sub>1</sub> ... p <sub>k</sub> NUL	1B 42 p <sub>1</sub> ... p <sub>k</sub> 00	27 66 p <sub>1</sub> ... p <sub>k</sub> 00

This command sets vertical tab stops in channel 0 (see [Select vertical tabulation channel](#) and [Set vertical tab stops in channel](#)). Up to 16 vertical tab stops can be defined per channel. Vertical tab stops set previously are reset.

The vertical tab stops must be specified in ascending order in lines. The absolute vertical tab stop locations depend on the current line spacing.

The line count begins with 1 at the first print line.

The set vertical tab stops are not affected by later changes of the line spacing.

All vertical tab stops are reset if no parameter is specified (*ESC B NUL*).

p<sub>1</sub> ... p<sub>k</sub>      Vertical tab stops in lines (1 ≤ k ≤ 16)

Range:                  X'01 ≤ p<sub>k</sub> ≤ X'FF

## Set vertical tab stops in channel

Control sequence	Hexadecimal	Decimal
ESC b p <sub>1</sub> p <sub>2</sub> ... p <sub>k</sub> NUL	1B 62 p <sub>1</sub> p <sub>2</sub> ... p <sub>k</sub> 00	27 98 p <sub>1</sub> p <sub>2</sub> ... p <sub>k</sub> 00

This command sets vertical tab stops in the specified channel (see [table “Set vertical tab stops” on page 86](#)).

Eight different vertical tabulation channels are available. Up to 16 vertical tab stops can be defined per channel. Vertical tab stops set previously in the specified channel are reset.

The vertical tab stops in the channel must be specified in ascending order in lines. The absolute vertical tab stop locations depend on the current line spacing.

The line count begins with 1 at the first print line.

The set vertical tab stops are not affected by later changes of the line spacing.

All vertical tab stops set in the specified channel are reset if parameters *p*<sub>2</sub> to *p*<sub>*k*</sub> are missing (*ESC b p1 NUL*).

p<sub>1</sub>                    Vertical tabulation channel

Range:                X'00 ≤ p<sub>k</sub> ≤ X'07

p<sub>2</sub> ... p<sub>k</sub>            Vertical tab stops in lines (2 ≤ k ≤ 17)

Range:                X'01 ≤ p<sub>k</sub> ≤ X'FF

## Vertical tabulation

Control character	Hexadecimal	Decimal
VT	0B	11

This control character causes vertical tabulation to the next vertical tab stop in the current vertical tabulation channel. Vertical tabulation is possible anywhere within a line.

Repeating this control character causes tab stops to be skipped. *VT VT VT*, for example, positions the print head to the third vertical tab stop. If no tab stops are set, this control character performs a line feed.



A carriage return is also performed depending on the menu setting. The expanded mode for one line is terminated by this control character.

## Print carriage movements

The following commands affect the print carriage movements:

- Carriage return
- Space
- Backspace
- Set 10 cpi
- Set 12 cpi
- Set 15 cpi
- Set/reset proportional spacing mode
- Set character spacing mode
- Absolute horizontal tabulation
- Relative horizontal tabulation
- Set horizontal tab stops
- Horizontal tabulation
- Set print direction (bidirectional or unidirectional)
- Set unidirectional print mode for one line
- Select text alignment

### Carriage return

Control character	Hexadecimal	Decimal
CR	0D	13

The print carriage moves to the beginning of the line (left margin). The character following *CR* is printed as the first character of the line.

**i** A line feed may be performed in addition to the carriage return depending on the menu setting. When writing new application programs, take care to terminate each line with *LF* and *CR*.

## Space

Control character	Hexadecimal	Decimal
SP	20	32

A space is printed using the set or programmed character pitch.

In the expanded and spaced modes the space width is increased accordingly.

## Backspace

Control character	Hexadecimal	Decimal
BS	08	08

The print head is backsaced one space width.

## Set 10 cpi (Pica)

Control sequence	Hexadecimal	Decimal
ESC P	1B 50	27 80

The character pitch is set to 10 cpi.

## Set 12 cpi (Elite)

Control sequence	Hexadecimal	Decimal
ESC M	1B 4D	27 77

The character pitch is set to 12 cpi.

## Set 15 cpi

Control sequence	Hexadecimal	Decimal
ESC g	1B 67	27 103

The character pitch is set to 15 cpi.

## Set/reset proportional spacing mode

Control sequence	Hexadecimal	Decimal
ESC p p <sub>1</sub>	1B 70 p <sub>1</sub>	27 112 p <sub>1</sub>

In the proportional spacing mode, the character width differs. An i, for example, is narrower than an m.

Proportional spacing is possible with all fonts except the OCR fonts.

When the proportional mode is reset, the previously set character pitch becomes effective again.

p<sub>1</sub> sets/resets the proportional spacing mode

Valid parameter values:

Dec	Hex	Meaning
0	00	Reset proportional spacing mode
1	01	Set proportional spacing mode
48	30	Reset proportional spacing mode
49	31	Set proportional spacing mode

## Set character spacing mode

Control sequence	Hexadecimal	Decimal
ESC SP p <sub>1</sub>	1B 20 p <sub>1</sub>	27 32 p <sub>1</sub>

This command sets the space between characters (spaced mode).

The space depends on the selected print quality.

p<sub>1</sub> Space in  $1/120$  inch increments in DRAFT mode

Space in  $1/180$  inch increments in LQ/NLQ mode

Range: X'00 ≤ p<sub>1</sub> ≤ X'7F

## Absolute horizontal tabulation

Control sequence	Hexadecimal	Decimal
ESC \\$ p <sub>1</sub> p <sub>2</sub>	1B 24 p <sub>1</sub> p <sub>2</sub>	27 36 p <sub>1</sub> p <sub>2</sub>

The print head is moved to the specified print position. The specified position is based on the set left margin and is defined in  $1/60$  inch increments.

p<sub>1</sub> p<sub>2</sub> define the absolute horizontal position

Horizontal position = (p<sub>1</sub> + (p<sub>2</sub> \* 256)) \*  $1/60$  inch

Range: X'00 ≤ p<sub>1</sub> ≤ X'FF

Range: X'00 ≤ p<sub>2</sub> ≤ X'03

## Relative horizontal tabulation

Control sequence	Hexadecimal	Decimal
ESC \ p <sub>1</sub> p <sub>2</sub>	1B 5C p <sub>1</sub> p <sub>2</sub>	27 92 p <sub>1</sub> p <sub>2</sub>

The print head moves right or left the defined amount. The shift is based on the current print position and is defined in  $^1/_{120}$  (DRAFT) or  $^1/_{180}$  inch increments.

p<sub>1</sub> p<sub>2</sub> define the shift

p<sub>2</sub> < X'80 causes a right shift.

Shift =  $(p_1 + (p_2 * 256)) * ^1/_{120}$  inch (DRAFT mode)

Shift =  $(p_1 + (p_2 * 256)) * ^1/_{180}$  inch (LQ/NLQ mode)

p<sub>2</sub> ≥ X'80 causes a left shift.

Shift =  $65536 - (p_1 + (p_2 * 256)) * ^1/_{120}$  inch (DRAFT mode)

Shift =  $65536 - (p_1 + (p_2 * 256)) * ^1/_{180}$  inch (LQ/NLQ mode)

Range (Draft): X'00 ≤ p<sub>1</sub> ≤ X'FF<sup>^</sup>

X'00 ≤ p<sub>2</sub> ≤ X'03

Range (NLQ/LQ): X'00 ≤ p<sub>1</sub> ≤ X'FF

X'00 ≤ p<sub>2</sub> ≤ X'03

## Set horizontal tab stops

Control sequence	Hexadecimal	Decimal
ESC D p <sub>1</sub> ... p <sub>k</sub> NUL	1B 44 p <sub>1</sub> ... p <sub>k</sub> 00	27 68 p <sub>1</sub> ... p <sub>k</sub> 00

This command sets horizontal tab stops. Up to 32 horizontal tab stops can be defined. Previously set horizontal tab stops are reset.

The horizontal tab stops must be defined in ascending order in multiples of the current character pitch. The absolute horizontal tab stop locations depend on the current character pitch.

The set horizontal tab stops are not affected by later changes of the character pitch.

The default is every eighth column.

All horizontal tab stops are reset if no parameter is specified (*ESC D NUL*).

p<sub>1</sub> ... p<sub>k</sub>      Horizontal tab stops in multiples of the character pitch (1 ≤ k ≤ 32)

Range:                X'01 ≤ p<sub>k</sub> ≤ X'FF

## Horizontal tabulation

Control character	Hexadecimal	Decimal
HT	09	09

The control character may be located anywhere within a line and causes the next horizontal tab stop to be accessed. Repeating this control character causes horizontal tab stops to be skipped. *HT HT HT HT*, for example, causes the fourth horizontal tab stop to be accessed.

Conditions for horizontal tabulation:

- At least one horizontal tab stop must be set.
- The printer ignores the control character if no horizontal tab stops are set or if the end of the line would be exceeded.
- If the print head is on a set horizontal tab stop, the next horizontal tab stop is accessed.

## Set print direction (bidirectional or unidirectional)

Control sequence	Hexadecimal	Decimal
ESC U p <sub>1</sub>	1B 55 p <sub>1</sub>	27 85 p <sub>1</sub>

Unidirectional printing should be used if high positioning precision is required (e.g. in the graphics mode). The default is bidirectional printing.

p<sub>1</sub> defines the print direction

Valid parameter values:

Dec	Hex	Meaning
0	00	Bidirectional print direction
1	01	Unidirectional print direction
48	30	Bidirectional print direction
49	31	Unidirectional print direction

**i** The command is ignored if the menu setting does not permit unidirectional printing (see [2]).

## Set unidirectional print mode for one line

Control sequence	Hexadecimal	Decimal
ESC <	1B 3C	27 60

The unidirectional print mode should be used if high positioning precision is required (e.g. in the graphics mode). The default is bidirectional printing.

**i** The command is ignored if the menu setting does not permit unidirectional printing (see [2]).

## Select text alignment

Control sequence	Hexadecimal	Decimal
ESC a p <sub>1</sub>	1B 61 p <sub>1</sub>	27 97 p <sub>1</sub>

The text alignment defines the horizontal position of a print line relative to the set margins (see [Set left margin](#)).

p<sub>1</sub> defines the text alignment mode

Valid parameter values:

Dec	Hex	Meaning
0	00	Left-justified text alignment
1	01	Centered text alignment
2	02	Right-justified text alignment
3	03	Justification (left and right)



Horizontal tabulation and backspaces are ignored except for left-justified alignment.

## Font design

The following commands are available for font design:

- Select font
- Select national version
- Select character set
- Set/reset user-defined character set
- Copy current character set into user-defined character set
- Define user-defined characters
- Select print quality
- Select character style
- Set italics mode
- Reset italics mode
- Set boldface mode
- Reset boldface mode
- Set double strike mode
- Reset double strike mode
- Set subscript/superscript mode
- Reset subscript/superscript mode
- Set condensed mode
- Reset condensed mode
- Set expanded mode for one line
- Set/reset expanded mode
- Reset expanded mode
- Set/reset double height mode
- Select print mode combination
- Set/reset underscore mode
- Set/reset line marking mode
- Additional commands

## Select font

Control sequence	Hexadecimal	Decimal
ESC k p <sub>1</sub>	1B 6B p <sub>1</sub>	27 107 p <sub>1</sub>

The default character complement of the printer contains eleven fonts. Further fonts can be plugged in with a PROM on the PM (personality module).

p<sub>1</sub> defines the font

Valid parameter values:

Dec	Hex	Meaning
0	00	Roman
1	01	Sans Serif
2	02	Courier
3	03	Prestige
4	04	Script
5	05	OCR-B
6	06	OCR-A
7	07	Orator-C
8	08	Orator



The OCR-A and OCR-B fonts are machine-readable fonts. Machine readability is ensured only if the character pitch is 10 cpi.

## Select national version

Control sequence	Hexadecimal	Decimal
ESC R p <sub>1</sub>	1B 52 p <sub>1</sub>	27 82 p <sub>1</sub>

This command allows switching between national versions anywhere within the text.

In the initial condition, the printer uses the national version selected in the menu.

p<sub>1</sub> defines the national version

Valid parameter values:

Dec	Hex	Meaning
0	00	USA
1	01	France
2	02	Germany
3	03	Great Britain
4	04	Denmark 1
5	05	Sweden
6	06	Italy
7	07	Spain 1
8	08	Japan
9	09	Norway
10	0A	Denmark 2
11	0B	Spain 2
12	0C	Latin America
13	0D	Turkey
64	40	Legal

## Select character set

Control sequence	Hexadecimal	Decimal
ESC t p <sub>1</sub>	1B 74 p <sub>1</sub>	27 116 p <sub>1</sub>

This command allows switching between character sets anywhere within the text.

In the initial condition, the printer uses the character set selected in the menu.

p<sub>1</sub> defines the character set

Valid parameter values:

Dec	Hex	Meaning
0	00	Epson ITALIC
1	01	Epson EXT GCT
2	02	User-defined character set

## Set/reset user-defined character set

Control sequence	Hexadecimal	Decimal
ESC % p <sub>1</sub>	1B 25 p <sub>1</sub>	27 37 p <sub>1</sub>

This command allows switching between the current character set and the user-defined character set anywhere within the text.

p<sub>1</sub> defines the character set

Valid parameter values:

Dec	Hex	Meaning
0	00	Current character set
1	01	User-defined character set

## Copy current character set into user-defined character set

Control sequence	Hexadecimal	Decimal
ESC : NUL p <sub>1</sub> NUL	1B 3A 00 p <sub>1</sub> 00	27 58 00 p <sub>1</sub> 00

This command copies the current character set into the user-defined character set.

p<sub>1</sub> defines the font of the current character set

Valid parameter values:

Dec	Hex	Meaning
0	00	Roman
1	01	San Serif
2	02	Courier
3	03	Prestige
4	04	Script
5	05	OCR-B
6	06	OCR-A
7	07	Orator-C
8	08	Orator



There must be sufficient memory space for the user-defined character set (see menu settings [2]). This can be done by setting the buffer size in the menu (see [2]) to a value < 32 Kbytes.

## Define user-defined characters

Control sequence	Hexadecimal	Decimal
ESC & NUL p <sub>1</sub> p <sub>2</sub> p <sub>3</sub> p <sub>4</sub> p <sub>5</sub> data	1B 26 00 p <sub>1</sub> p <sub>2</sub> p <sub>3</sub> p <sub>4</sub> p <sub>5</sub> data	27 38 00 p <sub>1</sub> p <sub>2</sub> p <sub>3</sub> p <sub>4</sub> p <sub>5</sub> data

One or several characters can be defined. If the current character set was loaded in the user-defined character set beforehand, the characters defined by this command are replaced.

p<sub>1</sub> specifies the code location of the first character to be defined

Range: X'00 to X'7F

p<sub>2</sub> specifies the code location of the last character to be defined

Range: p<sub>1</sub> to X'7F

p<sub>3</sub> specifies the number of leading blank columns of the character to be defined

Range: X'00 to X'2A (1 to 42 columns)

p<sub>4</sub> specifies the number of dot columns of the character to be defined

Range: X'00 to X'25 (1 to 37 columns)

p<sub>5</sub> specifies the number of trailing blank columns of the character to be defined

Range: X'00 to X'2A (1 to 42 columns)

Data Data bytes containing the dot information

Range: X'00 to X'FF (any bit of a byte may be 1 (dot) or 0 (no dot))

Meaning of parameters  $p_3$ ,  $p_4$  and  $p_5$ :

Print mode	Spacing	$p_3+p_4+p_5$ max.	$p_4$ max.	Horizontal resolution
DRAFT	10 cpi	12	9	$\frac{1}{120}$ inch
	12 cpi	12	9	
LQ	10 cpi	36	29	$\frac{1}{360}$ inch
	12 cpi	30	23	
Proportional		42	37	$\frac{1}{360}$ inch

The character information is transferred in 3 bytes per column. The number of data bytes to be transferred is thus  $3 \times p_4$  bytes. If you define more than one character, parameters  $p_3$ ,  $p_4$  and  $p_5$  must be defined before the dot information of the characters.



There must be sufficient memory space for the user-defined character set (see menu settings [2]).

The function is only valid with 8-bit data transfer (for the menu setting see [2]).

**Example**

		Leading blank columns P <sub>3</sub>									Dot columns of the character P <sub>4</sub>									Trailing blank columns P <sub>5</sub>	
		1	1	2	3	4	5	6	7	8	9	1	2								
First byte	$2^0$	.	o	.	o	.	o	.	o	.	o	.	.	.	.	.	.	.			
	$2^1$	.	o	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.			
	$2^2$	.	o	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.			
	$2^3$	.	o	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.			
	$2^4$	.	o	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.			
	$2^5$	.	o	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.			
	$2^6$	.	o	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.			
	$2^7$	.	o	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.			
Second byte	$2^0$	.	o	.	.	o	.	.	.	.	.	.	.	.	.	.	.	.			
	$2^1$	.	o	.	o	.	.	.	.	.	.	.	.	.	.	.	.	.			
	$2^2$	.	o	.	o	.	.	.	.	.	.	.	.	.	.	.	.	.			
	$2^3$	.	o	.	o	.	.	.	.	.	.	.	.	.	.	.	.	.			
	$2^4$	.	o	.	o	.	.	.	.	.	.	.	.	.	.	.	.	.			
	$2^5$	.	o	.	o	.	.	.	.	.	.	.	.	.	.	.	.	.			
	$2^6$	.	o	.	o	.	.	.	.	.	.	.	.	.	.	.	.	.			
	$2^7$	.	o	.	o	.	.	o	.	.	.	.	.	.	.	.	.	.			
Third byte	$2^0$	.	o	.	o	.	o	.	o	.	o	.	.	.	.	.	.	.			
	$2^1$	.	o	.	o	.	o	.	o	.	o	.	.	.	.	.	.	.			
	$2^2$	.	o	.	o	.	o	.	o	.	o	.	.	.	.	.	.	.			
	$2^3$	.	o	.	o	.	o	.	o	.	o	.	.	.	.	.	.	.			
	$2^4$	.	o	.	o	.	o	.	o	.	o	.	.	.	.	.	.	.			
	$2^5$	.	o	.	o	.	o	.	o	.	o	.	.	.	.	.	.	.			
	$2^6$	.	o	.	o	.	o	.	o	.	o	.	.	.	.	.	.	.			
	$2^7$	.	o	.	o	.	o	.	o	.	o	.	.	.	.	.	.	.			
Byte values for dot columns (Hex.)	FF 00 01 00 01 00 01 00 01									First byte											
	FF 00 02 00 07 00 00 00 00									Second byte											
	07 00 04 00 04 00 04 00 04									Third byte											

To load this character (in DRAFT and 10 cpi) in code location X'21 (decimal 33), the following control characters have to be sent to the printer:

- *ESC x 0* Set draft mode.
- *ESC P* Set 10 cpi.
- *ESC & NUL X'33 X'33* Define character (from code location 33 (X'21) to code location 33 (X'21), i.e. one character in this code location.  
  
X'01 X'09 X'02 1 leading blank column, 9 dot columns and 2 trailing blank columns.  
  
X'FFFF07 X'000000 X'010204 Data containing the dot information.  
X'000000 X'010704 X'000000 (Hex.) In this representation, three bytes of a dot column are combined for clarity.  
X'010004 X'000000 X'010004

## Select print quality

Control sequence	Hexadecimal	Decimal
ESC x p <sub>1</sub>	1B 78 p <sub>1</sub>	27 120 p <sub>1</sub>

DRAFT or LQ/NLQ is selected.

In the initial condition, the print quality is defined by the menu setting (see [2]).

p<sub>1</sub> defines the print quality

Valid parameter values:

Dec	Hex	Meaning
0	00	DRAFT mode
1	01	NLQ or LQ mode
48	30	DRAFT mode
49	31	NLQ or LQ mode

## Select character style

Control sequence	Hexadecimal	Decimal
ESC q p <sub>1</sub>	1B 71 p <sub>1</sub>	27 113 p <sub>1</sub>

The character style can be selected with this command.

p<sub>1</sub> defines the character style

Valid parameter values:

Dec	Hex	Meaning
0	00	Normal character style
1	01	Outline
2	02	Shadow
3	03	Outline + shadow

**Set italics mode**

Control sequence	Hexadecimal	Decimal
ESC 4	1B 34	27 52

**Reset italics mode**

Control sequence	Hexadecimal	Decimal
ESC 5	1B 35	27 53

**Set boldface mode**

Control sequence	Hexadecimal	Decimal
ESC E	1B 45	27 69

**Reset boldface mode**

Control sequence	Hexadecimal	Decimal
ESC F	1B 46	27 70

**Set double strike mode**

Control sequence	Hexadecimal	Decimal
ESC G	1B 47	27 71

**Reset double strike mode**

Control sequence	Hexadecimal	Decimal
ESC H	1B 48	27 72

## Set subscript/superscript mode

Control sequence	Hexadecimal	Decimal
ESC S p <sub>1</sub>	1B 53 p <sub>1</sub>	27 83 p <sub>1</sub>

This command causes reduced-size characters to be superscripted, i.e. printed as exponents, or subscripted, i.e. printed as indices.

Superscripted characters (exponents) are printed approx.  $\frac{1}{2}$  line up. Subscripted characters (indices) are only reduced in size and printed on the base line.

p<sub>1</sub> defines the subscript or superscript mode

Parameter values:

Dec	Hex	Meaning
0	00	Set superscript mode
1	01	Set subscript mode
48	30	Set superscript mode
49	31	Set subscript mode



The menu setting must be INDEX/EXPONENT (see [2]).

## Reset subscript/superscript mode

Control sequence	Hexadecimal	Decimal
ESC T	1B 54	27 84

Resets the subscript/superscript function.

## Set condensed mode

Control sequence	Hexadecimal	Decimal
SI	0F	15
ESC SI	1B 0F	27 15

The two commands are identical in function. The characters are printed in compressed form.

The resulting character pitch depends on the current character pitch.

Current character pitch in cpi	Compressed character pitch in cpi
10	17
12	20
15	Unchanged
Proportional	Proportional compressed

## Reset condensed mode

Control character	Hexadecimal	Decimal
DC2	12	18

## Set expanded mode for one line

Control sequence	Hexadecimal	Decimal
SO	0E	14
ESC SO	1B 0E	27 14

The two commands are identical in function. The characters are printed with double width in one line.

The function is terminated by the *LF*, *CR*, *VT*, *FF*, *DC4* and *ESC W 0* commands.

## Set/reset expanded mode

Control sequence	Hexadecimal	Decimal
ESC W p <sub>1</sub>	1B 57 p <sub>1</sub>	27 87 p <sub>1</sub>

In the expanded mode, the characters are printed with double width.

p<sub>1</sub> sets/resets the expanded mode

Valid parameter values:

Dec	Hex	Meaning
0	00	Reset expanded mode
1	01	Set expanded mode
48	30	Reset expanded mode
49	31	Set expanded mode

## Reset expanded mode

Control character	Hexadecimal	Decimal
DC4	14	20

## Set/reset double height mode

Control sequence	Hexadecimal	Decimal
ESC w p <sub>1</sub>	1B 77 p <sub>1</sub>	27 119 p <sub>1</sub>

The characters are printed with double height.

p<sub>1</sub> sets/resets the double height mode

Valid parameter values:

Dec	Hex	Meaning
0	00	Reset double height mode
1	01	Set double height mode
48	30	Reset double height mode
49	31	Set double height mode

## Select print mode combinations

Control sequence	Hexadecimal	Decimal
ESC ! p <sub>1</sub>	1B 21 p <sub>1</sub>	27 33 p <sub>1</sub>

The following characters are printed using the print mode combinations defined by parameter *p1*.

The command can be used with all fonts and font sizes.

p<sub>1</sub> Print mode combinations; interpreted bitwise

Bit position	Bit set (bit = 1)	Bit reset (bit = 0)
0	12 cpi	10 cpi
1	Set proportional mode	Reset proportional mode
2	Set condensed mode	Reset condensed mode
3	Set boldface mode	Reset boldface mode
4	Set double strike mode	Reset double strike mode
5	Set expanded mode	Reset expanded mode
6	Set italics mode	Reset italics mode
7	Set underscore mode	Reset underscore mode

## Set/reset underscore mode

Control sequence	Hexadecimal	Decimal
ESC - p <sub>1</sub>	1B 2D p <sub>1</sub>	27 45 p <sub>1</sub>

The characters are underscored.

p<sub>1</sub> sets/resets the underscore mode

Valid parameter values:

Dec	Hex	Meaning
0	00	Reset underscore mode
1	01	Set underscore mode

## Set/reset line marking mode

Control sequence	Hexadecimal	Decimal
ESC ( - p <sub>1</sub> p <sub>2</sub> p <sub>3</sub> p <sub>4</sub> p <sub>5</sub>	1B 28 2D p <sub>1</sub> p <sub>2</sub> p <sub>3</sub> p <sub>4</sub> p <sub>5</sub>	27 40 45 p <sub>1</sub> p <sub>2</sub> p <sub>3</sub> p <sub>4</sub> p <sub>5</sub>

The following characters are printed with an additional line mark.

p <sub>1</sub> = X'03	fixed value
p <sub>2</sub> = X'00	fixed value
p <sub>3</sub> = X'01	fixed value

p<sub>4</sub> defines the position of the line mark

Valid parameter values:

Dec	Hex	Meaning
1	01	Underscore
2	02	Cross out
3	03	Overscore

p<sub>5</sub> defines the type of line mark

Valid parameter values:

Dec	Hex	Meaning
0	00	Deactivates the line mark selected with p1
1	01	Single solid line
2	02	Double solid line
5	05	Single dashed line
6	06	Double dashed line

## Additional commands

### Graphical change of sizes

Control sequence	Hexadecimal	Decimal
ESC [ p <sub>1</sub> ; p <sub>2</sub> SP B	1B 5B p <sub>1</sub> 3B p <sub>2</sub> 20 42	27 91 p <sub>1</sub> 59 p <sub>2</sub> 32 66

Valid values:

p<sub>1</sub> = 100 / p<sub>2</sub> = 100

Normal height / normal width

p<sub>1</sub> = 200 / p<sub>2</sub> = 200

Double height / Double width

p<sub>1</sub> = 300 / p<sub>2</sub> = 300

Triple height / Triple width

p<sub>1</sub> = 400 / p<sub>2</sub> = 400

Quadruple height / Quadruple width

p<sub>1</sub> and p<sub>2</sub> max. = 800 (in steps of 100)

Graphical change of size for DATA LARGE:

p<sub>1</sub> = 100 / p<sub>2</sub> = 100

Normal height / normal width

p<sub>1</sub> and p<sub>2</sub> max. = 9900 (in steps of 100)

**Set national version and code page**

Control sequence	Hexadecimal	Decimal
ESC [ p <sub>1</sub> ; p <sub>2</sub> w	1B 5B p <sub>1</sub> 3B p <sub>2</sub> 77	27 91 p <sub>1</sub> 59 p <sub>2</sub> 119

p<sub>1</sub> = 1 to 15

For national version EPSON EXT.GCT:

- p<sub>1</sub> = 1 : U.S.A
- p<sub>1</sub> = 2 : France
- p<sub>1</sub> = 3 : Germany
- p<sub>1</sub> = 4 : U.K.
- p<sub>1</sub> = 5 : Denmark 1
- p<sub>1</sub> = 6 : Sweden
- p<sub>1</sub> = 7 : Italy
- p<sub>1</sub> = 8 : Spain 1
- p<sub>1</sub> = 9 : Japan
- p<sub>1</sub> = 10 : Norway
- p<sub>1</sub> = 11 : Denmark 2
- p<sub>1</sub> = 12 : Spain 2
- p<sub>1</sub> = 13 : Latin AM
- p<sub>1</sub> = 14 : Turkey
- p<sub>1</sub> = 15 : Legal

p<sub>2</sub> = 3 digit code of the code table

- p<sub>2</sub> = d<sub>3</sub> d<sub>2</sub> d<sub>1</sub> (three digits)
- 0 6 1 IBM set 1
- 0 6 2 IBM set 2
- 0 6 3 IBM code page
- 0 7 1 Epson EXT GCT

**Set national version**

Control sequence	Hexadecimal	Decimal
ESC [ p <sub>1</sub> w	1B 5B p <sub>1</sub> 77	27 91 p <sub>1</sub> 119

See the command “[Set national version and code page](#)” for the setting of *p1*.

**Set code page**

Control sequence	Hexadecimal	Decimal
ESC [ ; p <sub>2</sub> w	1B 5B 3B p <sub>2</sub> 77	27 91 59 p <sub>2</sub> 119

See the command “[Set national version and code page](#)” for the setting of *p2*.

**Set character pitch and select font**

Control sequence	Hexadecimal	Decimal
ESC [ p <sub>1</sub> ; p <sub>2</sub> x	1B 5B p <sub>1</sub> 3B p <sub>2</sub> 78	27 91 p <sub>1</sub> 59 p <sub>2</sub> 120

- p<sub>1</sub> = 1  
Data
- p<sub>1</sub> = 2  
Roman
- p<sub>1</sub> = 3  
Sans Serif
- p<sub>1</sub> = 4  
Courier
- p<sub>1</sub> = 5  
Prestige
- p<sub>1</sub> = 6  
Script
- p<sub>1</sub> = 7  
OCR-B
- p<sub>1</sub> = 8  
OCR-A
- p<sub>1</sub> = 9  
Orator-C
- p<sub>1</sub> = 10  
Orator
- p<sub>1</sub> = 11  
Data-Block
- p<sub>1</sub> = 12  
Data Large
- p<sub>2</sub> = 1  
10 cpi
- p<sub>2</sub> = 2  
12 cpi
- p<sub>2</sub> = 3  
15 cpi

$p_2 = 4$   
Proportional

$p_2 = 5$   
Proportional

$p_2 = 6$   
14.4 cpi

$p_2 = 7$   
18 cpi

$p_2 = 8$   
17.1 cpi

$p_2 = 9$   
20 cpi

### Select font

Control sequence	Hexadecimal	Decimal
ESC [ p <sub>1</sub> x	1B 5B p <sub>1</sub> 78	27 91 p <sub>1</sub> 120

See the command “[Set character pitch and select font](#)” for the setting of  $p_1$ .

### Set print quality (NLQ, LQ)

Control sequence	Hexadecimal	Decimal
ESC [ p <sub>1</sub> SP X	1B 5B p <sub>1</sub> 20 58	27 91 p <sub>1</sub> 32 88

$p_1 = 0$   
LQ

$p_1 = 1$   
NLQ

This is only valid if the NLQ type style is available.

## Bitmap graphics

The following commands are available:

- Select graphics mode
- Reassign graphics mode

### Select graphics mode

Control sequence	Hexadecimal	Decimal
ESC * p <sub>1</sub> p <sub>2</sub> p <sub>3</sub> data	1B 2A p <sub>1</sub> p <sub>2</sub> p <sub>3</sub> data	27 42 p <sub>1</sub> p <sub>2</sub> p <sub>3</sub> data

The graphics data is transferred in columns. A column contains either 8 or 24 individual vertical dots.

Each graphics line begins with this command, which defines the graphics mode (vertical and horizontal resolution). A defined number of pixel data items follows. The number of columns is defined by parameters  $p_2$  and  $p_3$ .

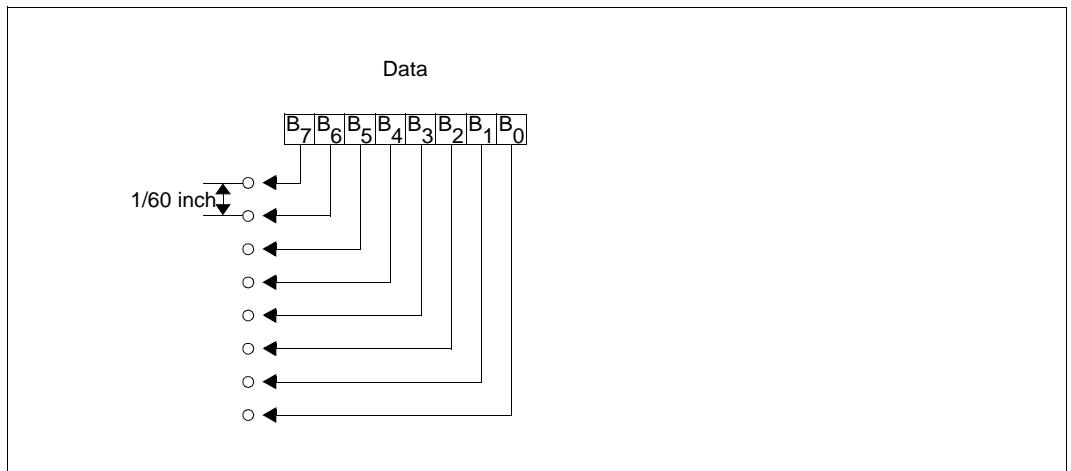


Figure 7: Vertical dot density 60 dpi

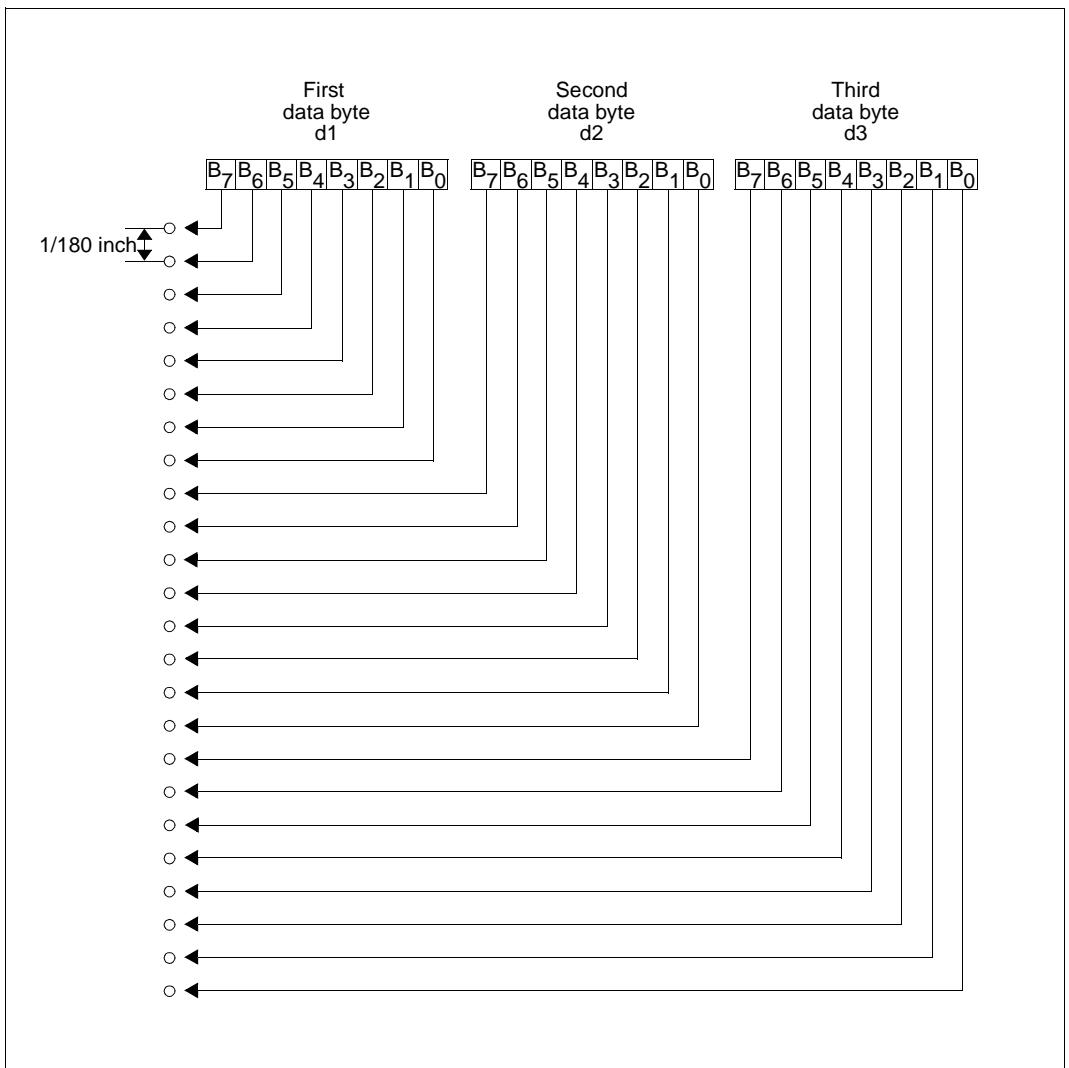


Figure 8: Vertical dot density 180 dpi

**p<sub>1</sub>** defines the graphics mode

Valid parameter values:

<b>Dec</b>	<b>Hex</b>	<b>Meaning</b>	<b>Number of needles</b>	<b>dpi</b>		<b>Compatible commands</b>
				<b>hori- zontal</b>	<b>verti- cal</b>	
0	00	Single density	8	60	60	<i>ESC K</i>
1	01	Double density	8	120	60	<i>ESC L</i>
2	02	Double density and high speed <sup>1)</sup>	8	120	60	<i>ESC Y</i>
3	03	Quadruple density <sup>1)</sup>	8	240	60	<i>ESC Z</i>
4	04	CRT 1	8	80	60	
6	06	CRT 2	8	90	60	
32	20	Single density	24	60	180	
33	21	Double density	24	120	180	
38	26	CRT 3	24	90	180	
39	27	Triple density	24	180	180	
40	28	Sixfold density <sup>1)</sup>	24	360	180	

<sup>1)</sup> In this mode, printing in adjacent columns is not possible.

**p<sub>2</sub> p<sub>3</sub>** define the number of columns

$$\text{Number of columns} = p_2 + (p_3 * 256)$$

**Data** Data bytes containing the dot information

## Reassign graphics mode

Control sequence	Hexadecimal	Decimal
ESC ? p <sub>1</sub> p <sub>2</sub>	1B 3F p <sub>1</sub> p <sub>2</sub>	27 63 p <sub>1</sub> p <sub>2</sub>

This command assigns new graphics modes to the commands:

*ESC K p<sub>1</sub> p<sub>2</sub> data*  
*ESC L p<sub>1</sub> p<sub>2</sub> data*  
*ESC Y p<sub>1</sub> p<sub>2</sub> data*  
*ESC Z p<sub>1</sub> p<sub>2</sub> data*

p<sub>1</sub> defines the graphics command

Valid parameter values:

Dec	Hex	Graphics command
75	4B	<i>ESC K</i>
76	4C	<i>ESC L</i>
89	59	<i>ESC Y</i>
90	5A	<i>ESC Z</i>

p<sub>2</sub> defines the graphics mode

Valid parameter values:

Dec	Hex	Mode	Number of needles	dpi		
				horiz- ontal	verti- cal	
0	00	Single density	8	60	60	
1	01	Double density	8	120	60	
2	02	Double density and high speed <sup>1)</sup>	8	120	60	
3	03	Quadruple density <sup>1)</sup>	8	240	60	
4	04	CRT 1	8	80	60	
6	06	CRT 2	8	90	60	
32	20	Single density	24	60	180	
33	21	Double density	24	120	180	
38	26	CRT 3	24	90	180	
39	27	Triple density	24	180	180	
40	28	Sixfold density <sup>1)</sup>	24	360	180	

1) In this mode, printing in adjacent columns is not possible.

## Miscellaneous commands

- Control characters between X'80 and X'9F
- Printing characters between X'80 and X'9F
- Reset most significant bit (MSB) to zero
- Set most significant bit (MSB) to one
- Delete most significant bit (MSB) default
- Set printer online
- Set printer offline
- Clear line buffer
- Delete character
- Audible signal
- NUL function
- Additional commands

### Control characters between X'80 and X'9F

Control sequence	Hexadecimal	Decimal
ESC 7	1B 37	27 55

Codes X'80 to X'9F are replaced by control codes X'00 to X'1F.

### Printing characters between X'80 and X'9F

Control sequence	Hexadecimal	Decimal
ESC 6	1B 36	27 54

The characters in this code table area are printing characters.

This command is ignored if the Epson ITALIC character set was selected (see [Select character set](#)).

## Reset most significant bit (MSB) to zero

Control sequence	Hexadecimal	Decimal
ESC =	1B 3D	27 61

Resets the most significant bit of all incoming data to zero.



This command restricts parameters to the range from 0 to 127.

## Set most significant bit (MSB) to one

Control sequence	Hexadecimal	Decimal
ESC >	1B 3E	27 62

Sets the most significant bit of all incoming data to one.



This command restricts parameters to the range from 128 to 255.

## Delete most significant bit (MSB) default

Control sequence	Hexadecimal	Decimal
ESC #	1B 23	27 35

This command deletes the default MSB specification.

## Set printer online

Control character	Hexadecimal	Decimal
DC1	11	17

Returns the printer to the online mode after the *Set printer offline* command.



The command is ineffective if the printer was set offline with the online button.

## Set printer offline

Control character	Hexadecimal	Decimal
DC3	13	19

Sets the printer offline. All following data is ignored except for the *Set printer online* command.



The printer cannot be set online with the online button.

## Clear line buffer

Control character	Hexadecimal	Decimal
CAN	18	24

Deletes the contents of the line buffer to the next control character.

## Delete character

Control character	Hexadecimal	Decimal
DEL	7F	127

Deletes the character received last.

## Audible signal

Control character	Hexadecimal	Decimal
BEL	07	07

This control character has no effect.

## NUL function

Control character	Hexadecimal	Decimal
NUL	00	00

This control character has no effect.

## Additional commands

### Command replacement \$\$

Control sequence	Hexadecimal	Decimal
\$\$	24 24	36 36

This command replaces the control character sequence *ESC* /, hexadecimal 1B 5B, decimal 27 91.

### Command replacement \$\$/

Control sequence	Hexadecimal	Decimal
\$\$/	24 24 2F	36 36 47

This command replaces the control character sequence *ESC*, hexadecimal 1B, decimal 27.

**Macro selection**

Control sequence	Hexadecimal	Decimal
ESC [ p <sub>1</sub> ; p <sub>2</sub> SP r	1B 5B p <sub>1</sub> 3B p <sub>2</sub> 20 72	27 91 p <sub>1</sub> 59 p <sub>2</sub> 32 114

p<sub>1</sub> can have the values 1 to 4.

p<sub>2</sub> selects the emulation

p<sub>2</sub> = 2  
IBM Proprinter

p<sub>2</sub> = 3  
IBM Proprinter, AGM

p<sub>2</sub> = 4  
Epson LQ-2550

## ESC / P2 Commands

- Set page format
- Set page length in defined units
- Set absolute vertical print position
- Set relative vertical print position
- Select font by pitch and point
- Set unit
- Set horizontal motion index (HMI)
- Assign character table
- Select character table
- Print data as characters
- Select graphics mode
- Print raster graphics

### Set page format

Control sequence	Hexadecimal	Decimal
ESC ( c p <sub>1</sub> p <sub>2</sub> p <sub>3</sub> p <sub>4</sub> p <sub>5</sub>	1B 28 63 p <sub>1</sub> p <sub>2</sub> p <sub>3</sub> p <sub>4</sub> p <sub>5</sub>	27 40 99 p <sub>1</sub> p <sub>2</sub> p <sub>3</sub> p <sub>4</sub> p <sub>5</sub>

This command sets top and bottom margins in defined units.

p<sub>1</sub> = 04 00

tm = p<sub>2</sub> + p<sub>3</sub> \* 256

tm: top margin in defined units

bm = p<sub>4</sub> + p<sub>5</sub> \* 256

bm: bottom margin in defined units

## Set page length in defined units

Control sequence	Hexadecimal	Decimal
ESC ( C p <sub>1</sub> p <sub>2</sub> p <sub>3</sub>	1B 28 43 p <sub>1</sub> p <sub>2</sub> p <sub>3</sub>	27 40 67 p <sub>1</sub> p <sub>2</sub> p <sub>3</sub>

p<sub>1</sub> = 02 00

p<sub>l</sub> = p<sub>2</sub> + p<sub>3</sub> \* 256

p<sub>l</sub>: number of defined units

## Set absolute vertical print position

Control sequence	Hexadecimal	Decimal
ESC ( V p <sub>1</sub> p <sub>2</sub> p <sub>3</sub>	1B 28 56 p <sub>1</sub> p <sub>2</sub> p <sub>3</sub>	27 40 86 p <sub>1</sub> p <sub>2</sub> p <sub>3</sub>

p<sub>1</sub> = 02 00

p = p<sub>2</sub> + p<sub>3</sub> \* 256

p: defines print position from top margin in defined units

## Set relative vertical print position

Control sequence	Hexadecimal	Decimal
ESC ( v p <sub>1</sub> p <sub>2</sub> p <sub>3</sub>	1B 28 76 p <sub>1</sub> p <sub>2</sub> p <sub>3</sub>	27 40 118 p <sub>1</sub> p <sub>2</sub> p <sub>3</sub>

p<sub>1</sub> = 02 00

p = p<sub>2</sub> + p<sub>3</sub> \* 256

p: moves the print position from top margin in defined units

## Select font by pitch and point

Control sequence	Hexadecimal	Decimal
ESC X p <sub>1</sub> p <sub>2</sub> p <sub>3</sub>	1B 58 p <sub>1</sub> p <sub>2</sub> p <sub>3</sub>	27 88 p <sub>1</sub> p <sub>2</sub> p <sub>3</sub>

p<sub>1</sub> = 0

No change in pitch

p<sub>1</sub> = 1

Selects proportional spacing

p<sub>1</sub> = 18, 24, 30, 36, 42, 48, 60 oder 72

Selects fixed pitch equal to 360/p<sub>1</sub> cpi

p = p<sub>2</sub> + p<sub>3</sub> \* 256

p: Point size in 0,5 points = p<sub>2</sub> + p<sub>3</sub> \* 256

1 point = 1/72 Zoll

p = 0

No change in point size

p = 16, 21, 24, 28, 32, 36, 40, 44, 48, 52, 56, 60, 64

## Set unit

Control sequence	Hexadecimal	Decimal
ESC ( U p <sub>1</sub> p <sub>2</sub>	1B 28 55 p <sub>1</sub> p <sub>2</sub>	27 40 85 p <sub>1</sub> p <sub>2</sub>

This command defines the unit used for positioning in n/3600 inches. This definition is valid for the following commands:

Set page format	ESC ( c p <sub>1</sub> p <sub>2</sub> p <sub>3</sub> p <sub>4</sub> p <sub>5</sub>
Set page length in defined units	ESC ( C p <sub>1</sub> p <sub>2</sub> p <sub>3</sub>
Set absolute vertical print position	ESC ( V p <sub>1</sub> p <sub>2</sub> p <sub>3</sub>
Set relative vertical print position	ESC ( v p <sub>1</sub> p <sub>2</sub> p <sub>3</sub>

p<sub>1</sub> = 01 00

p<sub>2</sub> = 10, 20, 30, 40, 50, 60 /3600"

Standard : p<sub>2</sub> = 10

## Set horizontal motion index (HMI)

Control sequence	Hexadecimal	Decimal
ESC c p <sub>1</sub> p <sub>2</sub>	1B 63 p <sub>1</sub> p <sub>2</sub>	27 99 p <sub>1</sub> p <sub>2</sub>

Selects pitch in steps of n/360".

HMI = p<sub>1</sub> + p<sub>2</sub> \* 256

HMI max. 3 Zoll.

## Assign character table

Control sequence	Hexadecimal	Decimal
ESC ( t p <sub>1</sub> p <sub>2</sub> p <sub>3</sub> p <sub>4</sub> p <sub>5</sub>	1B 28 74 p <sub>1</sub> p <sub>2</sub> p <sub>3</sub> p <sub>4</sub> p <sub>5</sub>	27 40 116 p <sub>1</sub> p <sub>2</sub> p <sub>3</sub> p <sub>4</sub>

p<sub>1</sub> = 3

p<sub>2</sub> = 0

p<sub>3</sub>      Character table, selected via p<sub>4</sub> and p<sub>5</sub>

range:                    0, 1, 2, 3, "0", "1", "2" oder "3"

p<sub>4</sub> p<sub>5</sub>      character table

0 0 :      Kursiv

1 0:      PC 437 (USA)

3 0:      PC 850 (Multilingual)

7 0:      PC 860 (Portugal)

8 0      PC 863 (French-Canada)

9 0      PC 865 (Norway)

44 0      PC 858

p<sub>4</sub> and p<sub>5</sub> are Decimal-characters

Four character tables can be assigned:

0 ≤ p<sub>3</sub> ≤ 3 or 48 ≤ p<sub>3</sub> ≤ 51

The command *select character table* will activate the assigned character table.

## Select character table

Control sequence	Hexadecimal	Decimal
ESC t p <sub>1</sub>	1B 74 p <sub>1</sub>	27 116 p <sub>1</sub>

p<sub>1</sub> = 0, 1, 2, 3, "0", "1", "2" oder "3"

This command selects one of the four character tables which are assigned by the command *assign character table*.

## Print data as characters

Control sequence	Hexadecimal	Decimal
ESC (^ p <sub>1</sub> p <sub>2</sub> data	1B 28 5E p <sub>1</sub> p <sub>2</sub>	27 40 94 p <sub>1</sub> , p <sub>2</sub>

This command prints data as characters.

$$p = p_1 + p_2 * 256$$

p = sum of data (number of bytes, which are to be printed as characters, not control codes)

Data: p bytes of data to be printed as characters

## Select graphics mode

Control sequence	Hexadecimal	Decimal
ESC ( G p <sub>1</sub> p <sub>2</sub>	1B 28 47 p <sub>1</sub> p <sub>2</sub>	27 40 71 p <sub>1</sub> , p <sub>2</sub>

p<sub>1</sub> = 01 00

p<sub>2</sub> = 1 or 49

selects graphics mode

Graphics mode may be reset by ESC @.

## Print raster graphics

Control sequence	Hexadecimal	Decimal
ESC . p <sub>1</sub> p <sub>2</sub> p <sub>3</sub> p <sub>4</sub> p <sub>5</sub> p <sub>6</sub>	1B 2E p <sub>1</sub> p <sub>2</sub> p <sub>3</sub> p <sub>4</sub> p <sub>5</sub> p <sub>6</sub>	27 46 p <sub>1</sub> p <sub>2</sub> p <sub>3</sub> p <sub>4</sub> p <sub>5</sub> p <sub>6</sub>

p<sub>1</sub> = 0  
graphics mode (not compressed)

p<sub>1</sub> = 1  
graphics mode, compressed

p<sub>2</sub> = 5, 10, 20  
vertical resolution in 3600/p<sub>2</sub> dpi

p<sub>3</sub> = 5, 10, 20  
horizontal resolution in 3600/p<sub>2</sub> dpi

p<sub>4</sub> = vertical dot count

range:                    1 ≤ p<sub>1</sub> ≤ 24

p = p<sub>5</sub> + p<sub>6</sub> \* 256

p: horizontal dot count

The following combination is not possible:

p<sub>2</sub> = 10, p<sub>3</sub> = 20

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## Barcodes

You can print the following barcodes with the 901x printer:

- Code 39
- 2 out of 5 Industrial
- 2 out of 5 Interleaved
- Codabar (Monarch)
- EAN-8 and EAN-13
  - EAN-8 and EAN-13 Add-on (EAN Add-On 2 and EAN Add-On 5)
- Code 93
- MSI Mod 10/10
- UPC-A and UPC-E
  - Code UPC-A and UPC-E Add-on (EAN Add-On 2 and EAN Add-On 5)
- Code 128 (EAN 128)
- POSTNET

Programming examples for the different barcode types are given on page [150](#) and up.

## General information

The print tolerance is smaller for horizontal barcodes than it is for vertical barcodes. Horizontal barcodes are automatically printed in unidirectional mode to ensure maximum accuracy. Vertically printed barcodes may be adversely affected by paper feed tolerances especially in the lower third of the last page of continuous form or on single sheets. This is why barcodes with small elements widths should be avoided.

The barcode symbol must fully fit on the logical page and must not exceed the page boundaries.

The number of characters including control, start and stop characters for a barcode symbol is limited to 50. Most barcode specifications and barcode reading systems accept far fewer characters per symbol.

It is recommended to check barcode applications and reading systems for compatibility.

The original printouts of all barcode symbols in the programming examples have been checked with commercially available barcode readers.

## Code 39

The character complement of the Code 39 comprises:

- 10 digits: 0 1 2 3 4 5 6 7 8 9
- 26 letters: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
- 7 special characters: Space \$ % + - . /
- 1 start/stop character: \*

The extended Code 39 allows the entire ASCII character set to be represented by combining one of the special characters with a letter.

The number of characters is variable. The start/stop characters are programmed with the special character \*. In the plain text line, the character \* is printed for start/stop.

The symbol layout is self-checking. A check digit is not required. If a check digit is to be used, it must be programmed in the application (and must be modulo 43). The Code 39 has the safest and most reliable structure among the industrial barcodes.

The ratio of wide to narrow elements should be between 2.0 and 3.0. A ratio of 2.5 is recommended for applications.

The barcode height should be 25% of the barcode length or 20 mm, whichever is greater. A barcode should consist of no more than 20 characters.

The blank zone before and after the barcode symbol should be at least 10 times the width of a narrow element.

#### Reference table for check digit calculation:

0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	G	H	I	J	K	L	M
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
N	O	P	Q	R	S	T	U	V	W	X	Y	Z	-	.	Sp	\$	/	+	%			
23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42			

Example of check digit calculation modulo 43:

- Information characters : CODE 39
- Sum of reference digits :  $12+24+13+14+38+3+9=113$
- Modulo 43 :  $113 \text{ mod } 43 = 27$  ( $113/43 = \text{rem. } 27$ )
- Check digit : 27
- Printable character : R (= 27)

## 2 out of 5 Industrial

The character complement of the 2 out of 5 Industrial code comprises:

- 10 digits: 0 1 2 3 4 5 6 7 8 9
- Start/stop characters: : /; </=

The number of characters is variable.

The start/stop characters are programmed with the characters : and ;. Alternatively, the characters < and = can be used as start/stop characters.

In the plain text line, the characters . and ; or < and = are printed for start/stop.

The symbol layout is self-checking. A check digit is not required but should be used (modulo 10 with a weighting of 3). The check digit must be programmed in the application.

The ratio of wide to narrow elements should be between 2.0 and 3.0. A ratio of 2.5 is recommended for applications.

The code permits large tolerances between  $\pm 15\%$  and 20%.

The blank zone before and after the barcode symbol should be at least 10 times the width of a narrow element.

## 2 out of 5 Interleaved

The character complement of the 2 out of 5 Interleaved code comprises:

- 10 digits: 0 1 2 3 4 5 6 7 8 9
- Start/stop characters: :;/<=

The number of characters is variable but must be even. If the number of characters is odd, a 0 is prefixed to make it even.

The start/stop characters are programmed with the characters : and ;. Alternatively, the characters < and = can be used as start/stop characters.

In the plain text line, the characters : and ; or < and = are printed for start/stop.

The symbol layout is self-checking. A check digit is not required. If a check digit is to be used, it must be programmed in the application (and must be modulo 10 with a weighting of 3).

The ratio of wide to narrow elements should be between 2.0 and 3.0. A ratio of 2.5 is recommended for applications.

The blank zone before and after the barcode symbol should be at least 10 times the width of a narrow element.

## Codabar

The character complement of the Codabar (Monarch) code comprises:

- 10 digits: 0 1 2 3 4 5 6 7 8 9
- 6 special characters: - \$ : / . +
- Start/stop characters: a/t, b/n, c/\*, d/e

The number of characters is variable. The start/stop characters are programmed with the characters a/t, b/n, c/\*, d/e. In the plain text line these characters are printed for start/stop.

The symbol layout is self-checking. A check digit is not required and is rarely used. The check digit must be programmed in the application.

The check digit method is modulo 16. In practice, modulo 10 with a weighting of 3 or modulo 11 are also used.

The ratio of wide to narrow elements should be between 2.0 and 3.0. A ratio of 2.5 is recommended for applications.

The barcode height should be 25% of the barcode length or 20 mm, whichever is greater.

The blank zone before and after the barcode symbol should be at least 10 times the width of a narrow element.

## EAN-8 and EAN-13

The EAN-8 and EAN-13 codes have a character set of 10 digits. The number of characters is fixed and is 8 for EAN-8 and 13 for EAN-13.

Layout of EAN-8:

- Two digits for the manufacturer's country
- Five digits for small-sized products
- One check digit

Layout of EAN-13:

- Two digits for the manufacturer's country
- Five digits for the manufacturer
- Five digits for the product
- One check digit

The border and separator characters are automatically generated by the printer. All characters are also printed as plain text.

The symbol layout is self-checking. A check digit is required. The check digit must be programmed in the application (and must be modulo 10 with a weighting of 3).

The code can be printed in the three sizes SC3, SC6 and SC9. The height of the symbol is variable but should be programmed to approximately match the width of the symbol.

The following minimum blank zones should be observed:

Size	Blank zones in mm		
	Left of symbol		Right of symbol
	EAN-8	EAN-13	
<b>SC3</b>	2.6	4.0	2.6
<b>SC6</b>	3.6	5.5	3.6
<b>SC9</b>	4.7	7.3	4.7

## EAN-8 and EAN-13 Add-on

The EAN-8 and EAN-13 codes with a two or five-digit add-on are printed automatically if two or five additional digits are programmed in the application.

The check digit calculation ignores the add-on digits.

Example of check digit calculation modulo 10 with a weighting of 3:

Plain text	: 4 1 2 3 4 5 6 7 8 9 0 1 8
Check digit	: 8
Information digit sequence	: 4 1 2 3 4 5 6 7 8 9 0 1
Weighting factors	: 1 3 1 3 1 3 1 3 1 3 1 3
Products	: 4 3 2 9 4 15 6 21 8 27 0 3
Sum of products	: 4+3+2+9+4+15+6+21+8+27+0+3=102
Modulo 10	: 102 mod 10 = 2 (102/10 = remndr. 2)
Difference from 10 is check digit	: 10-2=8
Check digit	: 8

## Code 93

The character complement of the Code 93 code comprises:

- 10 digits: 0 1 2 3 4 5 6 7 8 9
- 26 letters: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
- 7 special characters: Space \$ % + - . /
- 4 control characters:      (X'67 in ISO 7-bit or X'87 in EBCDIC)  
                            (X'68 in ISO 7-bit or X'88 in EBCDIC)  
                            (X'69 in ISO 7-bit or X'89 in EBCDIC)  
                            (X'6A in ISO 7-bit or X'91 in EBCDIC)
- 1 start character:      (X'61 in ISO 7-bit or X'81 in EBCDIC)
- 1 stop character:        (X'65 in ISO 7-bit or X'85 in EBCDIC)

The number of characters is variable. The start/stop characters are programmed with the characters, e.g. a/e.

In the plain text line, the special characters [ ] are printed for start/stop. All characters including the start, stop, control and check characters are also printed in the plain text line.

The symbol layout is not self-checking. Two check digits, C and K, are required and must be programmed in the application. The modulo 47 check digit layout is for the check digit C with a weighting of 1 to 10, for the check digit K with a weighting of 1 to 15.

The barcode height should be 15% of the barcode length or 0.25 inch, whichever is greater.

The blank zone before and after the barcode symbol should be at least 10 times the width of a narrow element.

**Reference table for check digit calculation:**

0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	G	H	I	J	K	L
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	-	.	Sp	\$	/	+	%	(\\$)
22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43
(%)	(/)	(+)																			
44	45	46																			

Example of check digit calculation:

Plain text	:	C	+	O	+	D	+	E	SP	9	3	W	I
Check character	:												
Check digit C	:	W	(weighting of 1, 2, ... 10, 1, 2, ... from right to left)										
Check digit K	:	I	(weighting of 1, 2, ... 15, 1, 2, ... from right to left)										
Information char seq.	:	C	+	O	+	D	+	E	SP	9	3		
Reference values	:	12	41	24	41	13	41	14	38	9	3		
Weighting factors for check digit C	:	10	9	8	7	6	5	4	3	2	1		
Weighting factors for check digit K	:	11	10	9	8	7	6	5	4	3	2	1	
Sum of products for check digit C	:	(12*10) + (41*9) + (24*8) + (41*7) + (13*6) + (41*5) + (14*4) + (38*3) + (9*2) + (3*1) = 1442											
Modulo 47	:	1442 mod 47 = 32 (1442/47 = 30, remainder 32)											
Check digit C	:	W (W corresponds to the reference number 32)											
Sum of products for check digit K	:	(12*11) + (41*10) + (24*9) + (41*8) + (13*7) + (41*6) + (14*5) + (38*4) + (9*3) + (3*2) + (32*1) = 1710											
Modulo 47	:	1710 mod 47 = 18 (1770/47 = 36, remainder 18)											
Check digit K	:	I (I corresponds to the reference number 18)											

The following characters are provided for coding the start and stop characters:

- Start character: a, b, c, d or s (hexadecimal: 61, 62, 63, 64 or 73)
- Stop character: e or f (hexadecimal: 65 or 66)

The control characters are coded as follows:

- (\$) hexadecimal: 67
- (%) hexadecimal: 68
- (/) hexadecimal: 69
- (\*) hexadecimal: 6A



The control characters are printed in plain text within a closed circle.

## MSI Mod 10/10

The character complement of the MSI Mod 10/10 code comprises:

- 10 digits: 0 1 2 3 4 5 6 7 8 9
- 1 start character: : (X'3A in ISO 7-bit or X'7A in EBCDIC)
- 1 stop character: ; (X'3B in ISO 7-bit or X'5E in EBCDIC)

The number of characters is variable. The start/stop characters are programmed with the characters : and ;.

In the plain text line, these characters are printed for start/stop.

A check digit is required and must be programmed in the application (and must be modulo 10 from a checksum generated in several stages).

The ratio of wide to narrow elements is fixed and is always 2 : 1.

The blank zone before and after the barcode symbol should be at least 10 times the width of a narrow element.

### Example of check digit calculation

Plain text	:	1	2	3	4	5	6	7	4	1
Plain text w/o check digit	:	1	2	3	4	5	6	7	4	
Check digit	:									1
New number generated from odd positions	:		2		4		6		4	
Multiplied by 2	:								2464 x 2 = 4928	
Sum of digits	:								4 + 9 + 2 + 8 = 23	
Sum of the even positions of the original number and sum from the last step	:								1 + 3 + 5 + 7 + 23 = 39	
Modulo 10	:								39 mod 10 = 9 (39/1110 = 3, rem. 9)	
Difference from 10 is the check digit	:								10 - 9 = 1	
Check digit	:								1	

## UPC-A and UPC-E

The number of characters in the UPC-A and UPC-E codes is fixed and is eight digits for UPC-E and twelve digits for UPC-A. The border and separator characters are automatically generated by the printer.

### UPC-A

The UPC-A code has the following layout:

- One digit as the system identifier
    - 0 = Standard consumer goods
    - 2 = Goods marked in-store
    - 3 = Pharmaceutical and medical supplies
    - 5 = Coupons
  - Five digits for the manufacturer number
  - Five digits for the product number
- One check digit

### UPC-E

The UPC-E code is a compressed version of UPC-A with zero suppression in specific digit sequences. Suppression of four consecutive zeros begins from the sixth digit from the left. Zero suppression must be performed by the application.

#### Example

012345000065 without zero suppression

01234565 with zero suppression

All digits except the system identifier and check character are printed in plain text. The symbol layout is self-checking.

A check digit is required. (Check digit calculation is performed modulo 10, with a weighting of 3, as in UPC-A, because UPC-E is a compressed form of UPC-A). The check digit must be programmed in the application. The check digit of the UPC-E symbol is calculated on the non-zero-suppressed digit sequence. The principle of check digit calculation is described in the section “EAN-8 and EAN-13”.

The code can be printed in the three sizes SC3, SC6 and SC9. The height of the symbol is variable but should be programmed to approximately match the width of the symbol.

The blank zone before and after the barcode symbol should be at least 0.1287 inch for SC3, at least 0.1755 inch for SC6, and at least 0.234 for SC9.

### UPC-A and UPC-E Add-on

UPC-A and UPC-E with a two or five-digit add-on are printed automatically if two or five additional digits are programmed in the application.

The check digit calculation ignores the add-on digits.

### Code 128 (EAN 128)

The Code 128 has a character set of 128 ASCII characters, four control characters (FNC1, FNC2, FNC3, FNC4) and four special characters (CODE A, CODE B, CODE C, SHIFT). The number of characters is variable. The three start characters, the stop character and the special characters are automatically generated by the printer to optimize the information density.

All printable ASCII characters are printed in the plain text line. All other characters, start, stop, control and special characters and the check digit are replaced by a space. The required check character is automatically generated by the printer. The symbol layout is self-checking.

If the barcode begins with FNC1 (hexadecimal 5D 43 31), this identifies EAN 128.

FNC2 (hexadecimal 5D 43 32) controls the reader for multiple reads.

FNC3 (hexadecimal 5D 43 33) is reserved for special reader functions.

FNC4 (hexadecimal 5D 43 34) is reserved for special future applications.

The barcode height should be 15% of the barcode length or 0.25 inch, whichever is greater.

Example of check digit calculation:

Plain text with check digit	:	0	0	3	4	0	1	2	3	4	5	1	2	3	4	5	6	7	8	9	5
Plain text w/o check digit	:	0	0	3	4	0	1	2	3	4	5	1	2	3	4	5	6	7	8	9	
Weighting factors	:	3	1	3	1	3	1	3	1	3	1	3	1	3	1	3	1	3	1	3	
Products	:	0	0	9	4	0	1	6	3	1	5	3	2	9	4	1	6	2	8	2	
																	2		5	1	7
Sum of products	:	135																			
Modulo 10	:	135 modulo 10 = 13, remainder 5																			
Check digit	:	10 - 5 = 5																			
Check digit	:	5																			

## POSTNET

The POSTNET code has a character set of ten digits.

The number of characters is fixed and depends on the application:

5-Digit Zip Code (A Field)	5 digits plus check digit
Zip + 4 Code (C Field)	9 digits plus check digit
Delivery Point Barcode (C Prime Field)	11 digits plus check digit

The start/stop characters and the check digit are automatically generated by the printer (modulo 10 with a weighting of 1). This barcode has **no** plain text line.

The barcode is a fixed size. The length varies with the number of digits. The barcode pitch is 21.18 bars/inch, the bar is 0.021 inch nominal, and the gap is 0.0255 inch.

The print quality (LQ/NLQ/draft), which determines the print speed, can be programmed in the application using specific control characters.

## Select barcode

The following specifications are required before barcode symbols can be printed:

- Barcode set selection
- Height and width of the bars and spaces
- Ratio of wide to narrow bars and spaces
- Barcode alignment (horizontal/vertical)
- Current print position after printing
- Plain text line (yes/no)

These specifications can be made at any time. The information is retained until the printer is reset.

Normal text is not affected by these specifications. The line pitch set for normal text remains unchanged.

The line pitch is set to  $1/12$  inch for the barcode to be printed.

Control char. sequence	Hexadecimal	Decimal
ESC [ ; p <sub>2</sub> ; p <sub>3</sub> ; p <sub>4</sub> ; p <sub>5</sub> ; p <sub>6</sub> ; p <sub>7</sub> SP z	1B 5B 3B p <sub>2</sub> 3B p <sub>3</sub> 3B p <sub>4</sub> 3B p <sub>5</sub> 3B p <sub>6</sub> 3B p <sub>7</sub> 20 7A	27 91 59 p <sub>2</sub> 59 p <sub>3</sub> 59 p <sub>4</sub> 59 p <sub>5</sub> 59 p <sub>6</sub> 59 p <sub>7</sub> 32 122

p<sub>2</sub> Specification of the barcode set whose characters are to be printed.

Values:

Horizontal barcode without plain text	Horizontal barcode with plain text	Vertical barcode without plain text	Vertical barcode with plain text	Barcode set
101	201	301	401	Code 39
102	202	302	402	2 out of 5 Industrial
103	203	303	403	2 out of 5 Inter-leaved
104	204	304	404	Codabar
105	205	---	---	EAN 8
106	206	---	---	EAN 13
107	207	307	407	Code 93
108	208	308	408	MSI Mod 10/10
109	209	---	---	UPC E
110	210	---	---	UPC A
111	211	311	411	Code 128
112	---	---	---	POSTNET

**p<sub>3</sub>** Specification of bar height; bar height = p<sub>3</sub> x 1/12 inch. A decimal whole number with one or two digits (from 1 to 99) can be specified.

 EAN and UPC codes with add-on code (EAN Add-On 2 or EAN Add-On 5) require a minimum height of 3/12 inch.

<b>Value of decimal place</b>	<b>p<sub>4</sub></b> <b>Width of bar</b>		<b>p<sub>5</sub></b> <b>Width of space</b>		<b>p<sub>6</sub></b> <b>Ratio of wide to narrow</b>
	<b>Code direction</b>	<b>horizontal vertical</b>	<b>Code direction</b>	<b>horizontal vertical</b>	
0	0.35 mm	0.28 mm	0.35 mm	0.28 mm	2.0 to 1
1	0.53 mm	0.42 mm	0.53 mm	0.42 mm	2.5 to 1
2	0.70 mm	0.56 mm	0.70 mm	0.56 mm	3.0 to 1
3	0.88 mm	0.70 mm	0.88 mm	0.70 mm	3.5 to 1
4	1.05 mm	0.85 mm	1.05 mm	0.85 mm	---
5	1.23 mm	0.99 mm	1.23 mm	0.99 mm	---
6	1.41 mm	1.12 mm	1.41 mm	1.12 mm	---
7	1.58 mm	1.27 mm	1.58 mm	1.27 mm	---

These values change with the degree of saturation of the ribbon. They are thus only valid for a new ribbon.

The module width is standardized with the EAN and UPC codes. The following values are valid for p<sub>6</sub> when setting the barcode:

- |                    |                          |
|--------------------|--------------------------|
| p <sub>6</sub> = 0 | Size: SC 3 <sup>1)</sup> |
| p <sub>6</sub> = 1 | Size: SC 6 <sup>1)</sup> |
| p <sub>6</sub> = 2 | Size: SC 9 <sup>1)</sup> |
| p <sub>6</sub> = 3 | Size: SC 3 <sup>1)</sup> |

<sup>1)</sup> SC 3, SC 6 and SC 9 refer to the DIN standard.

The ratio of wide to narrow is fixed with Code 93, MSI Mod 10/10 and Code 128. p<sub>6</sub> is thus not required and is ignored. POSTNET does not require the parameters p<sub>4</sub>, p<sub>5</sub> and p<sub>6</sub>.

p<sub>7</sub> Define the print direction (uni- or bi-directional)

p <sub>7</sub> = 0	uni-directional printing (standard)
p <sub>7</sub> = 1	uni-directional printing in LQ
p <sub>7</sub> = 2	bi-directional printing in LQ
p <sub>7</sub> = 3	uni-directional printing in NLQ
p <sub>7</sub> = 4	bi-directional printing in NLQ



If p<sub>7</sub> is not defined, the standard value (uni-directional) is valid.

The parameter UNI-DIRECT.CMD needs to be set via operator panel or ESC-sequence whenever a switch between uni-directional and bi-directional printing is intended.

In the following examples the parameter p<sub>7</sub> is not used. So the printing direction is uni-directional.

## Set/reset barcode mode

Mode	Control sequence	Hexadecimal	Decimal
Set	ESC [ ? 0 h	1B 5B 3F 30 68	27 91 63 48 104
Reset	ESC [ ? 0 l <sup>1)</sup>	1B 5B 3F 30 6C	27 91 63 48 108

<sup>1)</sup> This letter is a small „L“!

The printing of barcode symbols is set or reset with this control character.



The barcode must be selected before the barcode mode is activated. While the barcode mode is on, no other escape sequences are permitted. No page break is allowed within a barcode symbol!

## Programming examples

### Code 39

Programming:

Barcode header : ESC [ ; n2 ; n3 ; n4 ; n5 ; n6 SP z  
header

Example : ESC [ ; 201 ; 8 ; 1 ; 1 ; 1 SP z

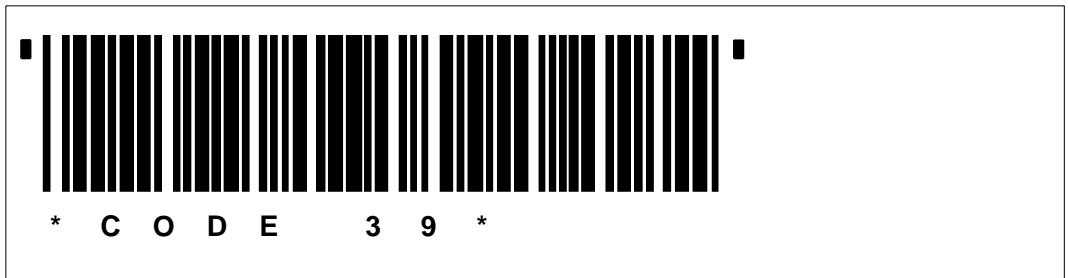
Set barcode mode : ESC [ ? 0 h

Data : \* CODE 39 \*

Reset barcode mode : ESC [ ? 0 l<sup>1)</sup>

<sup>1)</sup> This letter is a small “L”!

Printout:



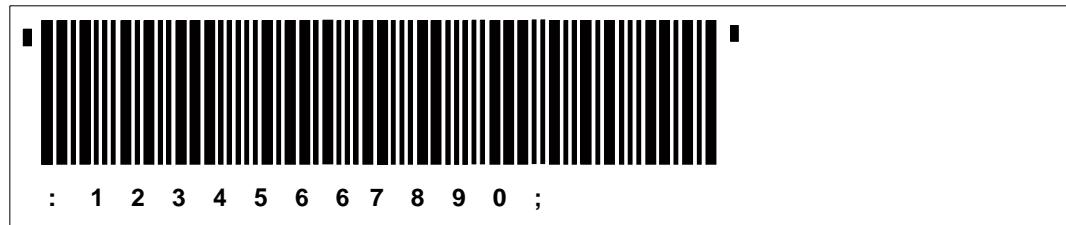
**2 out of 5 Industrial**

Programming:

Barcode header : ESC [ ; n2 ; n3 ; n4 ; n5 ; n6 SP z  
Example : ESC [ ; 202 ; 8 ; 1 ; 1 ; 1 SP z  
Set barcode mode : ESC [ ? 0 h  
Data : : 1 2 3 4 5 6 7 8 9 0 ;  
Reset barcode mode : ESC [ ? 0 l<sup>1)</sup>

<sup>1)</sup> This letter is a small "L"!

Printout:

**2 out of 5 Interleaved**

Programming:

Barcode header : ESC [ ; n2 ; n3 ; n4 ; n5 ; n6 SP z  
Example : ESC [ ; 203 ; 8 ; 1 ; 1 ; 1 SP z  
Set barcode mode : ESC [ ? 0 h  
Data : : 1 2 3 4 5 6 7 8 9 0 ;  
Reset barcode mode : ESC [ ? 0 l<sup>1)</sup>

<sup>1)</sup> This letter is a small "L"!

Printout:



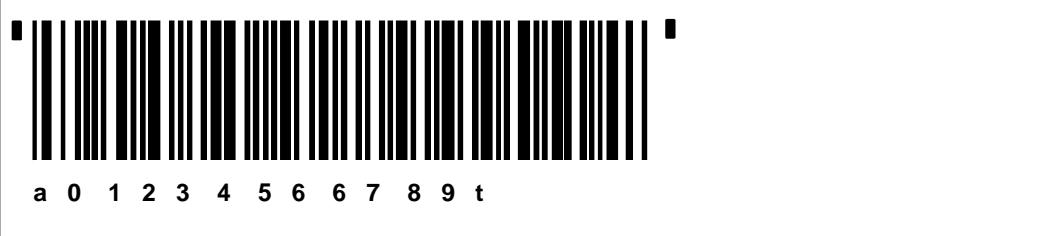
**Codabar (Monarch)**

Programming:

Barcode header : ESC [ ; n2 ; n3 ; n4 ; n5 ; n6 SP z  
Example : ESC [ ; 204 ; 8 ; 1 ; 1 ; 1 SP z  
Set barcode mode : ESC [ ? 0 h  
Data : a 0 1 2 3 4 5 6 7 8 9 0 t  
Reset barcode mode : ESC [ ? 0 l<sup>1)</sup>

<sup>1)</sup> This letter is a small “L”!

Printout:

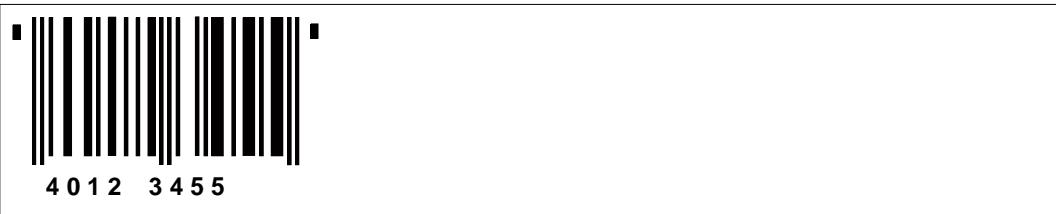
**EAN-8**

Programming:

Barcode header : ESC [ ; n2 ; n3 ; n4 ; n5 ; n6 SP z  
Example : ESC [ ; 205 ; 8 ; ; ; 1 SP z  
Set barcode mode : ESC [ ? 0 h  
Data : 4 0 1 2 3 4 5 5  
Reset barcode mode : ESC [ ? 0 l<sup>1)</sup>

<sup>1)</sup> This letter is a small “L”!

Printout:



### EAN-8 Add-on 2

Programming:

Barcode header : ESC [ ; n2 ; n3 ; n4 ; n5 ; n6 SP z  
Example : ESC [ ; 205 ; 8 ; ; ; 1 SP z  
Set barcode mode : ESC [ ? 0 h  
Data : 4 0 1 2 3 4 5 5 1 2  
Reset barcode mode : ESC [ ? 0 l<sup>1)</sup>

<sup>1)</sup> This letter is a small “L”!

Printout:



### EAN-8 Add-on 5

Programming:

Barcode header : ESC [ ; n2 ; n3 ; n4 ; n5 ; n6 SP z  
Example : ESC [ ; 205 ; 8 ; ; ; 1 SP z  
Set barcode mode : ESC [ ? 0 h  
Data : 4 0 1 2 3 4 5 5 8 6 1 0 4  
Reset barcode mode : ESC [ ? 0 l<sup>1)</sup>

<sup>1)</sup> This letter is a small “L”!

Printout:



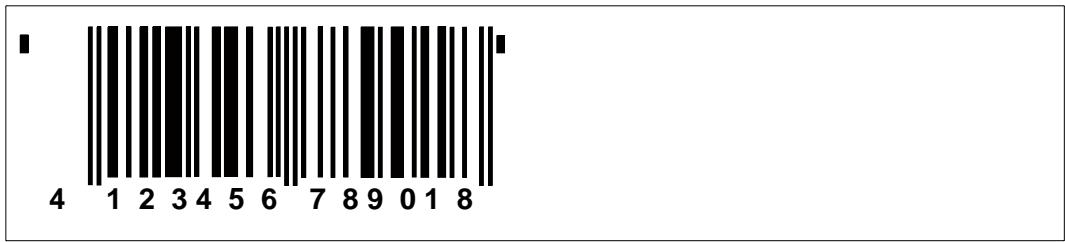
### EAN-13

Programming:

Barcode header : ESC [ ; n2 ; n3 ; n4 ; n5 ; n6 SP z  
Example : ESC [ ; 206 ; 8 ; ; ; 1 SP z  
Set barcode mode : ESC [ ? 0 h  
Data : 4 1 2 3 4 5 6 7 8 9 0 1 8  
Reset barcode mode : ESC [ ? 0 l<sup>1)</sup>

<sup>1)</sup> This letter is a small “L”!

Printout:



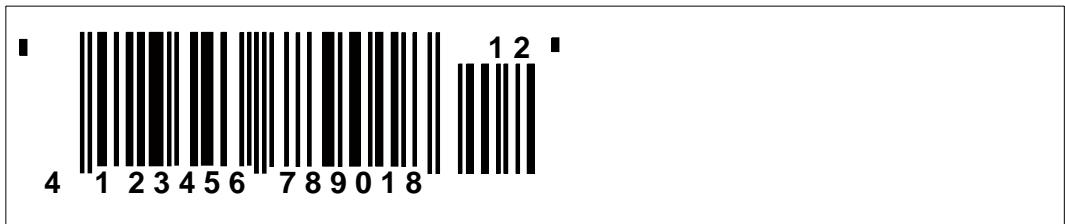
### EAN-13 Add-on 2

Programming:

Barcode header : ESC [ ; n2 ; n3 ; n4 ; n5 ; n6 SP z  
Example : ESC [ ; 206 ; 8 ; ; ; 1 SP z  
Set barcode mode : ESC [ ? 0 h  
Data : 4 1 2 3 4 5 6 7 8 9 0 1 8 1 2  
Reset barcode mode : ESC [ ? 0 l<sup>1)</sup>

<sup>1)</sup> This letter is a small “L”!

Printout:



### EAN-13 Add-on 5

Programming:

Barcode header : ESC [ ; n2 ; n3 ; n4 ; n5 ; n6 SP z  
Example : ESC [ ; 206 ; 8 ; ; ; 1 SP z  
Set barcode mode : ESC [ ? 0 h  
Data : 4 1 2 3 4 5 6 7 8 9 0 1 8 8 6 1 0 4  
Reset barcode mode : ESC [ ? 0 l<sup>1)</sup>

<sup>1)</sup> This letter is a small “L”!

Printout:



### Code 93

Programming:

Barcode header : ESC [ ; n2 ; n3 ; n4 ; n5 ; n6 SP z  
Example : ESC [ ; 207 ; 8 ; 1 ; 1 SP z  
Set barcode mode : ESC [ ? 0 h  
Data : a C + O + D + E 9 3 W I e  
Reset barcode mode : ESC [ ? 0 l<sup>1)</sup>

<sup>1)</sup> This letter is a small “L”!

Printout:



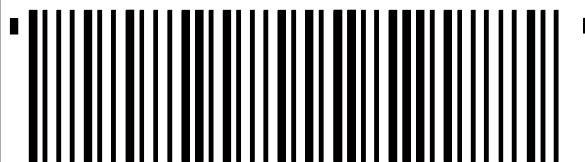
**MSI Mod 10/10**

Programming:

Barcode header : ESC [ ; n2 ; n3 ; n4 ; n5 ; n6 SP z  
Example : ESC [ ; 208 ; 8 ; 1 ; 1 ; SP z  
Set barcode mode : ESC [ ? 0 h  
Data : : 1 2 3 4 5 6 7 4 1 ;  
Reset barcode mode : ESC [ ? 0 l<sup>1)</sup>

<sup>1)</sup> This letter is a small “L”!

Printout:



: 1 2 3 4 5 6 7 4 1 ;

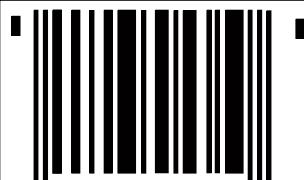
**UPC-E**

Programming:

Barcode header : ESC [ ; n2 ; n3 ; n4 ; n5 ; n6 SP z  
Example : ESC [ ; 209 ; 8 ; ; ; 1 SP z  
Set barcode mode : ESC [ ? 0 h  
Data : 0 1 2 3 4 5 6 5  
Reset barcode mode : ESC [ ? 0 l<sup>1)</sup>

<sup>1)</sup> This letter is a small “L”!

Printout:



1 2 3 4 5 6

### UPC-E Add-on 2

Programming:

Barcode header : ESC [ ; n2 ; n3 ; n4 ; n5 ; n6 SP z  
Example : ESC [ ; 209 ; 8 ; ; ; 1 SP z  
Set barcode mode : ESC [ ? 0 h  
Data : 0 1 2 3 4 5 6 5 1 2  
Reset barcode mode : ESC [ ? 0 l<sup>1)</sup>

<sup>1)</sup> This letter is a small “L”!

Printout:



### UPC-E Add-on 5

Programming:

Barcode header : ESC [ ; n2 ; n3 ; n4 ; n5 ; n6 SP z  
Example : ESC [ ; 209 ; 8 ; ; ; 1 SP z  
Set barcode mode : ESC [ ? 0 h  
Data : 0 1 2 3 4 5 6 5 8 6 1 0 4  
Reset barcode mode : ESC [ ? 0 l<sup>1)</sup>

<sup>1)</sup> This letter is a small “L”!

Printout:



### UPC-A

Programming:

Barcode header : ESC [ ; n2 ; n3 ; n4 ; n5 ; n6 SP z  
Example : ESC [ ; 210 ; 8 ; ; ; 1 SP z  
Set barcode mode : ESC [ ? 0 h  
Data : 0 1 2 3 4 5 6 7 8 9 0 5  
Reset barcode mode : ESC [ ? 0 l<sup>1)</sup>

<sup>1)</sup> This letter is a small “L”!

Printout:



### UPC-A Add-on 2

Programming:

Barcode header : ESC [ ; n2 ; n3 ; n4 ; n5 ; n6 SP z  
Example : ESC [ ; 210 ; 8 ; ; ; 1 SP z  
Set barcode mode : ESC [ ? 0 h  
Data : 0 1 2 3 4 5 6 7 8 9 0 5 1 2  
Reset barcode mode : ESC [ ? 0 l<sup>1)</sup>

<sup>1)</sup> This letter is a small “L”!

Printout:



### UPC-A Add-on 5

Programming:

Barcode header : ESC [ ; n2 ; n3 ; n4 ; n5 ; n6 SP z  
Example : ESC [ ; 210 ; 8 ; ; ; 1 SP z  
Set barcode mode : ESC [ ? 0 h  
Data : 0 1 2 3 4 5 6 7 8 9 0 5 8 6 1 0 4  
Reset barcode mode : ESC [ ? 0 l<sup>1)</sup>

<sup>1)</sup> This letter is a small “L”!

Printout:



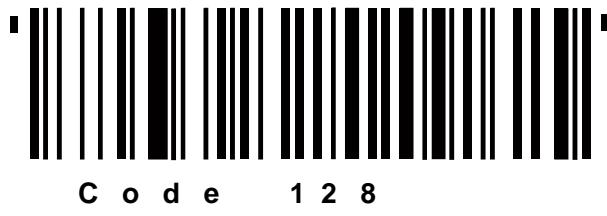
### Code 128

Programming:

Barcode header : ESC [ ; n2 ; n3 ; n4 ; n5 ; n6 SP z  
Example : ESC [ ; 211 ; 8 ; 1 ; 1 ; SP z  
Set barcode mode : ESC [ ? 0 h  
Data : Code 128  
Reset barcode mode : ESC [ ? 0 l<sup>1)</sup>

<sup>1)</sup> This letter is a small “L”!

Printout:



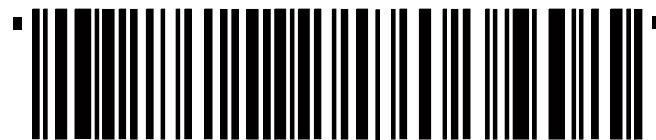
## EAN 128

Programming:

Barcode header : ESC [ ; n2 ; n3 ; n4 ; n5 ; n6 SP z  
Example : ESC [ ; 211 ; 8 ; 1 ; 1 ; SP z  
Set barcode mode : ESC [ ? 0 h  
Data : ]C100340123451234567895 (FNC = ]C1)  
Reset barcode mode : ESC [ ? 0 l<sup>1)</sup>

<sup>1)</sup> This letter is a small “L”!

Printout:



0 0 3 4 0 1 2 3 4 5 1 2 3 4 5 6 7 8 9 5

## POSTNET

Programming with DPBC (delivery point barcode):

Barcode header : ESC [ ; n2 ; n3 ; n4 ; n5 ; n6 SP z  
Example : ESC [ ; 112 ; ; ; ; SP z  
Set barcode mode : ESC [ ? 0 h  
Data : 1 2 3 4 5 6 7 8 9 0 1  
Reset barcode mode : ESC [ ? 0 l<sup>1)</sup>  
Data : CR LF LF  
Mark Pollan CR LF  
101 Main St CR LF  
Anytown US 12345-6789

<sup>1)</sup> This letter is a small “L”!

Printout:





The following examples use blank zones before and after the barcode symbol. The size of the blank zones is barcode-specific. The minimum sizes must be observed and must be provided by the application by positioning control functions before and after the barcode symbol.

### Two horizontal barcode symbols side by side

Programming:

Barcode header	:	ESC [ ; n2 ; n3 ; n4 ; n5 ; n6 SP z
Example	:	ESC [ ; 201 ; 7 ; 0 ; 0 ; 1 SP z
Set barcode mode	:	ESC [ ? 0 h
Data	:	* CODE 39 *
Reset barcode mode	:	ESC [ ? 0 l <sup>1)</sup>
Blank zone	:	SP SP SP
Set barcode mode	:	ESC [ ? 0 h
Data	:	* CODE 39 *
Reset barcode mode	:	ESC [ ? 0 l <sup>1)</sup>

<sup>1)</sup> This letter is a small "L"!

Printout:



**Two horizontal barcode symbols one beneath the other**

Programming:

Barcode header : ESC [ ; n2 ; n3 ; n4 ; n5 ; n6 SP z  
Example : ESC [ ; 201 ; 7 ; 0 ; 0 ; 1 SP z  
Set barcode mode : ESC [ ? 0 h  
Data : \* CODE 39 \*  
Reset barcode mode : ESC [ ? 0 l<sup>1)</sup>  
Specify spacing : CR LF LF LF LF LF LF LF LF  
Set barcode mode : ESC [ ? 0 h  
Data : \* CODE 39 \*  
Reset barcode mode : ESC [ ? 0 l<sup>1)</sup>

<sup>1)</sup> This letter is a small "L"!

Printout:



**Two vertical barcode symbols side by side**

Programming:

Barcode header	:	ESC [ ; n2 ; n3 ; n4 ; n5 ; n6 SP z
Example	:	ESC [ ; 401 ; 7 ; 0 ; 0 ; 1 SP z
Set barcode mode	:	ESC [ ? 0 h
Data	:	* CODE 39 *
Reset barcode mode	:	ESC [? 0 l <sup>1)</sup>
Horizontal position	:	SP SP SP
Set barcode mode	:	ESC [ ? 0 h
Data	:	* CODE 39 *
Reset barcode mode	:	ESC [ ? 0 l <sup>1)</sup>

<sup>1)</sup> This letter is a small "L"!

Printout:



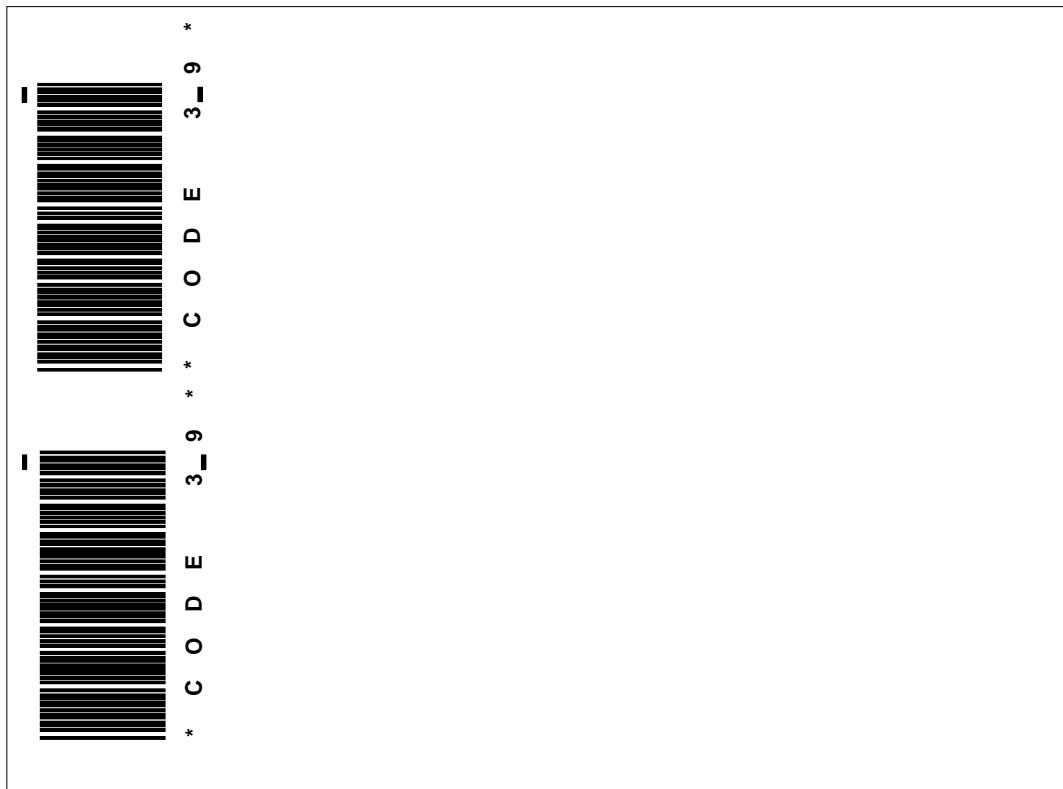
**Two vertical barcode symbols one beneath the other**

Programming:

Barcode header	:	ESC [ ; n2 ; n3 ; n4 ; n5 ; n6 SP z
Example	:	ESC [ ; 401 ; 7 ; 0 ; 0 ; 1 SP z
Set barcode mode	:	ESC [ ? 0 h
Data	:	* CODE 39 *
Reset barcode mode	:	ESC [ ? 0 l <sup>1)</sup>
Specify spacing	:	CR LF
Set barcode mode	:	ESC [ ? 0 h
Data	:	* CODE 39 *
Reset barcode mode	:	ESC [ ? 0 l <sup>1)</sup>

<sup>1)</sup> This letter is a small "L"!

Printout:



## Format of the 13-digit standard EAN number

Example of the format of an EAN number (European Article Numbering)

Country code	Standard company number (bbn)	Manufacturer's article number	Check digit
4 0	1 2 3 4 5	2 0 3 7 5	2
FRG coorganization center	Company name and address	Item and packing unit	99% reliability

Check digit generation in the above example:

- 1) Addition of the numbers in the odd positions  
 $4 + 1 + 3 + 5 + 0 + 7 = 20$
- 2) Addition of the numbers in the even positions  
 $0 + 2 + 4 + 2 + 3 + 5 = 16$
- 3) Multiplication by 3 of the sum in 2)  
 $16 \times 3 = 48$
- 4) Addition of the results of 1) and 3)  
 $48 + 20 = 68$
- 5) Modulo 10 check digit (difference from the nearest multiple of 10)  
 $70 - 68 = 2$

---

# Command overview of the IBM Proprinter emulation

## Forms transport mechanisms

Command	Control sequence	Hexa-decimal	Decimal	Remark	See page
Eject sheet	ESC [ < s	1B 5B 3C 73	27 91 60 115		<a href="#">17</a>
Select paper source and ejection, number of copies, cut-off mode	ESC [ > p <sub>1</sub> ; p <sub>2</sub> ; p <sub>3</sub> ; p <sub>4</sub> S	1B 5B 3E p <sub>1</sub> 3B p <sub>2</sub> 3B p <sub>3</sub> 3B p <sub>4</sub> 73	27 91 62 p <sub>1</sub> 59 p <sub>2</sub> 59 p <sub>3</sub> 59 p <sub>4</sub> 115		<a href="#">17</a>

## Forms layout

Command	Control sequence	Hexa-decimal	Decimal	Remark	See page
Set form length in lines	ESC C p <sub>1</sub>	1B 43 p <sub>1</sub>	27 67 p <sub>1</sub>	X' 01 ≤ p <sub>1</sub> ≤ X' 7F	<a href="#">22</a>
Set form length in inches	ESC C NUL p <sub>1</sub>	1B 00 43 p <sub>1</sub>	27 00 67 p <sub>1</sub>	X' 01 ≤ p <sub>1</sub> ≤ X' 16	<a href="#">23</a>
Set perforation skip mode	ESC N p <sub>1</sub>	1B 4E p <sub>1</sub>	27 78 p <sub>1</sub>	X' 00 ≤ p <sub>1</sub> ≤ X' FF in lines	<a href="#">23</a>
Reset perforation skip mode	ESC O	1B 4F	27 79		<a href="#">24</a>
Set first print line	ESC 4	1B 34	27 52	First print line corresponds to top of form	<a href="#">24</a>
Set left margin	ESC ;	1B 3B	27 59		<a href="#">24</a>
Set left and right margins	ESC X p <sub>1</sub> p <sub>2</sub>	1B 58 p <sub>1</sub> p <sub>2</sub>	27 88 p <sub>1</sub> p <sub>2</sub>	p <sub>1</sub> Left margin p <sub>2</sub> Right margin in columns	<a href="#">25</a>

## Forms transport

Command	Control sequence	Hexa-decimal	Decimal	Remark	See page
Set 8 lpi	ESC 0	1B 30	27 48		<a href="#">26</a>
Set $\frac{7}{72}$ inch line spacing mode	ESC 1	1B 31	27 49		<a href="#">26</a>
Preset $\frac{n}{72}$ inch line spacing mode	ESC A p <sub>1</sub>	1B 41 p <sub>1</sub>	27 65 p <sub>1</sub>	X' 01 ≤ p <sub>1</sub> ≤ X' 55	<a href="#">27</a>
Set preset line spacing	ESC 2	1B 32	27 50		<a href="#">27</a>
Set $\frac{n}{216}$ or $\frac{n}{180}$ inch line spacing mode	ESC 3 p <sub>1</sub>	1B 33 p <sub>1</sub>	27 51 p <sub>1</sub>	X' 01 ≤ p <sub>1</sub> ≤ X' FF	<a href="#">27</a>
Set line spacing unit	ESC [\ EOT NUL NUL NUL p <sub>1</sub> NUL	1B 5B 5C 04 00 00 00 p <sub>1</sub> 00	27 91 92 04 00 00 00 p <sub>1</sub> 00	p <sub>1</sub> Line spacing unit	<a href="#">28</a>
Line feed (LF)	LF	0A	10		<a href="#">28</a>
Reverse line feed	ESC M	1B 4D	27 77		<a href="#">29</a>
Form feed (FF)	FF	0C	12		<a href="#">29</a>
Relative vertical tabulation forward	ESC J p <sub>1</sub>	1B 4A p <sub>1</sub>	27 74 p <sub>1</sub>	X' 00 ≤ p <sub>1</sub> ≤ X' FF in $\frac{1}{216}$ inch or in $\frac{1}{180}$ inch increments	<a href="#">29</a>
Set vertical tab stops	ESC B p <sub>1</sub> ... p <sub>k</sub> NUL	1B 42 p <sub>1</sub> ... p <sub>k</sub> 00	27 66 p <sub>1</sub> ... p <sub>k</sub> 00		<a href="#">30</a>
Vertical tabulation	VT	0B	11		<a href="#">30</a>

Command	Control sequence	Hexa-decimal	Decimal	Remark	See page
Additional commands:					<a href="#">17</a>
Load line spacing	ESC [ p <sub>1</sub> {	1B 5B p <sub>1</sub> 7B	27 91 p <sub>1</sub> 123		
Reset tab stop	ESC [ p <sub>1</sub> g	1B 5B p <sub>1</sub> 67	27 91 p <sub>1</sub> 103		<a href="#">31</a>

## Print carriage movements

Command	Control character sequence	Hexa-decimal	Decimal	Remark	See page
Carriage return	CR	0D	13		<a href="#">32</a>
Print head to left margin	ESC <	1B 3C	27 60		<a href="#">33</a>
Space	SP	20	32		<a href="#">33</a>
Backspace	BS	08	08		<a href="#">33</a>
Set 10 cpi (Pica)	DC2	12	18		<a href="#">33</a>
Set 12 cpi (Elite)	ESC :	1B 3A	27 58		<a href="#">34</a>
Set 17.1 cpi	SI	0F	16		<a href="#">34</a>
Set/reset proportional spacing mode	ESC P p <sub>1</sub>	1B 50 p <sub>1</sub>	27 80 p <sub>1</sub>	p <sub>1</sub> = X' 00, X' 30 Fixed p <sub>1</sub> = X' 01, X' 31 Proportional	<a href="#">34</a>
Relative horizontal tabulation	ESC d p <sub>1</sub> p <sub>2</sub>	1B 64 p <sub>1</sub> p <sub>2</sub>	27 100 p <sub>1</sub> p <sub>2</sub>	$\frac{1}{120}$ inch increments	<a href="#">35</a>
Set horizontal tab stops	ESC D p <sub>1</sub> ... p <sub>k</sub> NUL	1B 44 p <sub>1</sub> ... p <sub>k</sub> 00	27 68 p <sub>1</sub> ... p <sub>k</sub> 00		<a href="#">36</a>
Horizontal tabulation	HT	09	09		<a href="#">37</a>
Set print direction (bidirectional or unidirectional)	ESC U p <sub>1</sub>	1B 55 p <sub>1</sub>	27 85 p <sub>1</sub>	p <sub>1</sub> = X' 00, X' 30 Bidirectional p <sub>1</sub> = X' 01, X' 31 Unidirectional	<a href="#">37</a>

Command	Control character sequence	Hexa-decimal	Decimal	Remark	See page
Additional commands:					<a href="#">38</a>
Absolute horizontal positioning	ESC [ p <sub>1</sub> ‘	1B 5B p <sub>1</sub> 60	27 91 p <sub>1</sub> 96		<a href="#">38</a>
Relative horizontal positioning	ESC [ p <sub>1</sub> a	1B 5B p <sub>1</sub> 61	27 91 p <sub>1</sub> 97		<a href="#">38</a>
Absolute vertical positioning	ESC [ p <sub>1</sub> d	1B 5B p <sub>1</sub> 64	27 91 p <sub>1</sub> 100		<a href="#">38</a>
Relative vertical positioning	ESC [ p <sub>1</sub> e	1B 5B p <sub>1</sub> 65	27 91 p <sub>1</sub> 101		<a href="#">38</a>

## Font design

Command	Control character sequence	Hexa-decimal	Decimal	Remark	See page
Select IBM character set 1	ESC 7	1B 37	27 55		<a href="#">39</a>
Select IBM character set 2	ESC 6	1B 36	27 54		<a href="#">40</a>
Set boldface mode	ESC E	1B 45	27 69		<a href="#">40</a>
Reset boldface mode	ESC F	1B 46	27 70		<a href="#">40</a>
Set double strike mode	ESC G	1B 47	27 71		<a href="#">40</a>
Reset double strike mode	ESC H	1B 48	27 72		<a href="#">40</a>
Set subscript/superscript mode	ESC S p <sub>1</sub>	1B 53 p <sub>1</sub>	27 83 p <sub>1</sub>	p <sub>1</sub> = X' 00, X' 30 Superscript p <sub>1</sub> = X' 01, X' 31 Subscript	<a href="#">41</a>
Reset subscript/superscript mode	ESC T	1B 54	27 84		<a href="#">41</a>
Set expanded mode for one line	SO	0E	14		<a href="#">42</a>
	ESC SO	1B 0E	27 14		
Set/reset expanded mode	ESC W p <sub>1</sub>	1B 57 p <sub>1</sub>	27 87 p <sub>1</sub>	p <sub>1</sub> = X' 00, X' 30 Reset p <sub>1</sub> = X' 01, X' 31 Set	<a href="#">42</a>
Reset expanded mode	DC4	14	20		<a href="#">42</a>
Set character size and line spacing	ESC [ @ EOT NUL NUL NUL p <sub>1</sub> p <sub>2</sub>	1B 5B 40 04 00 00 00 p <sub>1</sub> p <sub>2</sub>	27 91 64 04 00 00 00 p <sub>1</sub> p <sub>2</sub>	p <sub>1</sub> Line spacing and character width p <sub>2</sub> Character height	<a href="#">43</a>

Command	Control character sequence	Hexa-decimal	Decimal	Remark	See page
Set print quality and character pitch	ESC I p <sub>1</sub>	1B 49 p <sub>1</sub>	27 73 p <sub>1</sub>	Valid values p <sub>1</sub> : X' 00 DRAFT 10 cpi X' 02 LQ/NLQ 10 cpi X' 03 LQ/NLQ prop. X' 08 DRAFT 12 cpi X' 0A LQ/NLQ 12 cpi X' 10 DRAFT 17 cpi X' 12 LQ/NLQ 17 cpi	<a href="#">44</a>
Set/reset underscore mode	ESC - p <sub>1</sub>	1B 2D p <sub>1</sub>	27 45 p <sub>1</sub>	p <sub>1</sub> = X' 00, X' 30 Reset p <sub>1</sub> = X' 01, X' 31 Set	<a href="#">44</a>
Set/reset overscore mode	ESC _ p <sub>1</sub>	1B 5F p <sub>1</sub>	27 95 p <sub>1</sub>	p <sub>1</sub> = X' 00, X' 30 Reset p <sub>1</sub> = X' 01, X' 31 Set	<a href="#">45</a>
Additional commands:					<a href="#">45</a>
Set graphic settings	ESC [ p <sub>1</sub> m	1B 5 B p <sub>1</sub> 6D	27 91 p <sub>1</sub> 109		
Character repetition	ESC [ p <sub>1</sub> b	1B 5 B p <sub>1</sub> 62	27 91 p <sub>1</sub> 98		<a href="#">45</a>
Graphical change of size	ESC [ p <sub>1</sub> ; p <sub>2</sub> SP B	1B 5 B p <sub>1</sub> 3B p <sub>2</sub> 20 42	27 91 p <sub>1</sub> 59 p <sub>2</sub> 32 66		<a href="#">45</a>
Set national version and code page	ESC [ p <sub>1</sub> ; p <sub>2</sub> w	1B 5B p <sub>1</sub> 3B p <sub>2</sub> 77	27 91 p <sub>1</sub> 59 p <sub>2</sub> 119		<a href="#">45</a>
Set national version	ESC [ p <sub>1</sub> w	1B 5B p <sub>1</sub> 77	27 91 p <sub>1</sub> 119		<a href="#">45</a>
Set code page	ESC [ ; p <sub>2</sub> w	1B 5B 3B p <sub>2</sub> 77	27 91 59 p <sub>2</sub> 119		<a href="#">49</a>
Set character pitch and select font	ESC [ p <sub>1</sub> ; p <sub>2</sub> x	1B 5B p <sub>1</sub> 3B p <sub>2</sub> 78	27 91 p <sub>1</sub> 59 p <sub>2</sub> 120		<a href="#">49</a>

Command	Control character sequence	Hexa-decimal	Decimal	Remark	See page
Select font	ESC [ p <sub>1</sub> x	1B 5B p <sub>1</sub> 78	1B 5B p <sub>1</sub> 78		<a href="#">51</a>
Set print quality (NLQ, LQ)	ESC [ p <sub>1</sub> SP X	1B 5B p <sub>1</sub> 20 58	27 91 p <sub>1</sub> 32 88		<a href="#">51</a>

## Bitmap graphics

Command	Control sequence	Hexa-decimal	Decimal	Remark	See page
Select graphics mode	ESC * p <sub>1</sub> p <sub>2</sub> p <sub>3</sub> data	1B 2A p <sub>1</sub> p <sub>2</sub> p <sub>3</sub> data	27 42 p <sub>1</sub> p <sub>2</sub> p <sub>3</sub> data	p <sub>1</sub> p <sub>2</sub> p <sub>3</sub> Number of columns	<a href="#">52</a>
Select single dot-density graphics mode	ESC K p <sub>1</sub> p <sub>2</sub> data	1B 4B p <sub>1</sub> p <sub>2</sub> data	27 75 p <sub>1</sub> p <sub>2</sub> data	p <sub>1</sub> p <sub>2</sub> Number of columns	<a href="#">55</a>
Select double dot-density graphics mode	ESC L p <sub>1</sub> p <sub>2</sub> data	1B 4C p <sub>1</sub> p <sub>2</sub> data	27 76 p <sub>1</sub> p <sub>2</sub> data	p <sub>1</sub> p <sub>2</sub> Number of columns	<a href="#">55</a>
Select double dot-density and double-speed graphics mode	ESC Y p <sub>1</sub> p <sub>2</sub> data	1B 59 p <sub>1</sub> p <sub>2</sub> data	27 89 p <sub>1</sub> p <sub>2</sub> data	p <sub>1</sub> p <sub>2</sub> Number of columns	<a href="#">55</a>
Select quadruple dot-density graphics mode	ESC Z p <sub>1</sub> p <sub>2</sub> data	1B 5A p <sub>1</sub> p <sub>2</sub> data	27 90 p <sub>1</sub> p <sub>2</sub> data	p <sub>1</sub> p <sub>2</sub> Number of columns	<a href="#">57</a>
Select graphics mode (expanded)	ESC [ g p <sub>1</sub> p <sub>2</sub> p <sub>3</sub> data	1B 5B 67 p <sub>1</sub> p <sub>2</sub> p <sub>3</sub> data	27 91 103 p <sub>1</sub> p <sub>2</sub> p <sub>3</sub> data	p <sub>1</sub> p <sub>2</sub> Number of graphics data bytes + 1 p <sub>3</sub> Graphics mode	<a href="#">58</a>

## Miscellaneous commands

Command	Control sequence	Hexa-decimal	Decimal	Remark	See page
Set default tab stops	ESC R	1B 52	27 82		<a href="#">61</a>
Transparent print data for one character	ESC ^ p <sub>1</sub>	1B 5E p <sub>1</sub>	27 94 p <sub>1</sub>	p <sub>1</sub> Character code	<a href="#">61</a>
Transparent print data for several characters	ESC \ p <sub>1</sub> p <sub>2</sub>	1B 5C p <sub>1</sub> p <sub>2</sub>	27 92 p <sub>1</sub> p <sub>2</sub>	No. = (p <sub>1</sub> +(p <sub>2</sub> *256)	<a href="#">62</a>
Automatic line feed	ESC 5 p <sub>1</sub>	1B 35 p <sub>1</sub>	27 53 p <sub>1</sub>	p <sub>1</sub> = X' 00, X' 30 CR = CR p <sub>1</sub> = X' 01, X' 31 CR = CR + LF	<a href="#">62</a>
Set printer online	DC1	11	17		<a href="#">63</a>
Set printer offline	ESC Q #	1B 51 23	27 81 35		<a href="#">63</a>
Set printer offline	ESC Q \$	1B 51 24	27 81 36		<a href="#">63</a>
Clear line buffer	CAN	18	24		<a href="#">63</a>
Delete character	DEL	7F	127		<a href="#">63</a>
NUL function	NUL	00	00		<a href="#">64</a>
Additional commands:					<a href="#">64</a>
Command replacement \$\$	\$\$	24 24	36 36		
Command replacement \$\$/	\$\$/	24 24 2F	36 36 47		<a href="#">64</a>

Command	Control sequence	Hexa-decimal	Decimal	Remark	See page
Macro selection	ESC [ p <sub>1</sub> ; p <sub>2</sub> SP r	1B 5B p <sub>1</sub> 3B p <sub>2</sub> 20 72	27 91 p <sub>1</sub> 59 p <sub>2</sub> 32 114		<a href="#">64</a>
Set barcode	ESC [ ;p <sub>2</sub> ; p <sub>3</sub> ;p <sub>4</sub> ;p <sub>5</sub> ;p <sub>6</sub> SP z	1B 5B 3B p <sub>2</sub> 3B p <sub>3</sub> 3B p <sub>4</sub> 3B p <sub>5</sub> 3B p <sub>6</sub> 20 7A	27 91 59 p <sub>2</sub> 59 p <sub>3</sub> 59 p <sub>4</sub> 59 p <sub>5</sub> 59 p <sub>6</sub> 32 122		<a href="#">146</a>
Set/reset barcode	On: ESC [ ? 0 h  Off: ESC [ ? 0 I	1B 5B 3F 30 68  1B 5B 3F 30 6C	27 91 63 48 104  27 91 63 48 108		<a href="#">150</a>

## Alternative graphics mode AGM

Command	Control sequence	Hexa-decimal	Decimal	Remark	See page
Set $n/60$ inch line spacing mode	ESC A p <sub>1</sub>	1B 41 p <sub>1</sub>	27 65 p <sub>1</sub>	X' 01 ≤ p <sub>1</sub> ≤ X' 55	<a href="#">65</a>
Set $n/216$ or $n/180$ inch line spacing mode	ESC 3 p <sub>1</sub>	1B 33 p <sub>1</sub>	27 51 p <sub>1</sub>	X' 01 ≤ p <sub>1</sub> ≤ X' FF	<a href="#">65</a>
Relative vertical tabulation forward	ESC J p <sub>1</sub>	1B 4A p <sub>1</sub>	27 74 p <sub>1</sub>	X' 00 ≤ p <sub>1</sub> ≤ X' FF in $1/180$ inch or in $1/216$ inch increments	<a href="#">66</a>
Select graphics mode	ESC * p <sub>1</sub> p <sub>2</sub> p <sub>3</sub> data	1B 2A p <sub>1</sub> p <sub>2</sub> p <sub>3</sub> data	27 42 p <sub>1</sub> p <sub>2</sub> p <sub>3</sub> data	p <sub>1</sub> p <sub>2</sub> p <sub>3</sub> Graphics mode Number of columns	<a href="#">67</a>

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# Command overview of the Epson LQ-2550 emulation

## Initial condition

Command	Control sequence	Hexa-decimal	Decimal	Remark	See page
Reset to initial condition	ESC @	1B 40	27 64		<a href="#">72</a>

## Forms transport mechanism

Command	Control sequence	Hexa-decimal	Decimal	Remark	See page
Select single form feed	ESC EM p <sub>1</sub>	1B 19 p <sub>1</sub>	27 25 p <sub>1</sub>	Ignored	<a href="#">73</a>
Eject sheet	ESC [ < s	1B 5B 3C 73	27 91 60 115		<a href="#">74</a>
Select paper source and ejection, number of copies, cut-off mode	ESC [ > p <sub>1</sub> ; p <sub>2</sub> ; p <sub>3</sub> ; p <sub>4</sub> s	1B 5B 3E p <sub>1</sub> 3B p <sub>2</sub> 3B p <sub>3</sub> 3B p <sub>4</sub> 73	27 91 62 p <sub>1</sub> 59 p <sub>2</sub> 59 p <sub>3</sub> 59 p <sub>4</sub> 115		<a href="#">74</a>

## Forms layout

Command	Control sequence	Hexa-decimal	Decimal	Remark	See page
Set form length in lines	ESC C p <sub>1</sub>	1B 43 p <sub>1</sub>	27 67 p <sub>1</sub>	X' 01 ≤ p <sub>1</sub> ≤ X' 7F	<a href="#">79</a>
Set form length in inches	ESC C NUL p <sub>1</sub>	1B 43 00 p <sub>1</sub>	27 67 00 p <sub>1</sub>	X' 01 ≤ p <sub>1</sub> ≤ X' 16	<a href="#">80</a>
Set perforation skip mode	ESC N p <sub>1</sub>	1B 4E p <sub>1</sub>	27 78 p <sub>1</sub>	X' 01 ≤ p <sub>1</sub> ≤ X' 7F in lines	<a href="#">80</a>
Reset perforation skip mode	ESC O	1B 4F	27 79		<a href="#">81</a>
Set left margin	ESC I p <sub>1</sub>	1B 6C p <sub>1</sub>	27 108 p <sub>1</sub>	X' 00 ≤ p <sub>1</sub> ≤ X' FC in columns	<a href="#">81</a>
Set right margin	ESC Q p <sub>1</sub>	1B 51 p <sub>1</sub>	27 81 p <sub>1</sub>	X' 04 ≤ p <sub>1</sub> ≤ X' FF in columns	<a href="#">81</a>

## Forms transport

Command	Control sequence	Hexa-decimal	Decimal	Remark	See page
Set 8 lpi	ESC 0	1B 30	27 48		<a href="#">82</a>
Set 6 lpi	ESC 2	1B 32	27 50		<a href="#">82</a>
Set $n/_{60}$ inch line spacing mode	ESC A p <sub>1</sub>	1B 41 p <sub>1</sub>	27 65 p <sub>1</sub>	X' 00 ≤ p <sub>1</sub> ≤ X' 7F	<a href="#">83</a>
Set $n/_{180}$ inch line spacing mode	ESC 3 p <sub>1</sub>	1B 33 p <sub>1</sub>	27 51 p <sub>1</sub>	X' 00 ≤ p <sub>1</sub> ≤ X' FF	<a href="#">83</a>
Set $n/_{360}$ inch line spacing mode	ESC + p <sub>1</sub>	1B 2B p <sub>1</sub>	27 43 p <sub>1</sub>	X' 00 ≤ p <sub>1</sub> ≤ X' FF	<a href="#">84</a>
Line feed	LF	0A	10		<a href="#">84</a>
Form feed	FF	0C	12		<a href="#">84</a>
Relative vertical tabulation forward	ESC J p <sub>1</sub>	1B 4A p <sub>1</sub>	27 74 p <sub>1</sub>	X' 00 ≤ p <sub>1</sub> ≤ X' FF in $1/_{180}$ inch increments	<a href="#">85</a>
Relative vertical tabulation reverse	ESC j p <sub>1</sub>	1B 6A p <sub>1</sub>	27 106 p <sub>1</sub>	X' 00 ≤ p <sub>1</sub> ≤ X' FF in $1/_{180}$ inch increments	<a href="#">85</a>
Select vertical tabulation channel	ESC / p <sub>1</sub>	1B 2F p <sub>1</sub>	27 47 p <sub>1</sub>	X' 00 ≤ p <sub>1</sub> ≤ X' 07	<a href="#">85</a>
Set vertical tab stops	ESC B p <sub>1</sub> ... p <sub>k</sub> NUL	1B 42 p <sub>1</sub> ... p <sub>k</sub> 00	27 66 p <sub>1</sub> ... p <sub>k</sub> 00		<a href="#">86</a>
Set vertical tab stops in channel	ESC b p <sub>1</sub> p <sub>2</sub> ... p <sub>k</sub> NUL	1B 62 p <sub>1</sub> p <sub>2</sub> ... p <sub>k</sub> 00	27 98 p <sub>1</sub> p <sub>2</sub> ... p <sub>k</sub> 00		<a href="#">87</a>

Command	Control sequence	Hexa-decimal	Decimal	Remark	See page
Vertical tabulation	VT	0B	11		<a href="#">88</a>

## Print carriage movements

Command	Control sequence	Hexa-decimal	Decimal	Remark		See page
Carriage return	CR	0D	13			<a href="#">89</a>
Space	SP	20	32			<a href="#">90</a>
Backspace	BS	08	08			<a href="#">90</a>
Set 10 cpi (Pica)	ESC P	1B 50	27 80			<a href="#">90</a>
Set 12 cpi (Elite)	ESC M	1B 4D	27 77			<a href="#">90</a>
Set 15 cpi	ESC g	1B 67	27 103			<a href="#">91</a>
Set/reset proportional spacing mode	ESC p p <sub>1</sub>	1B 70 p <sub>1</sub>	27 112 p <sub>1</sub>	p <sub>1</sub> p <sub>1</sub>	X' 00, X' 30 Fixed X' 01, X' 30 Proportional	<a href="#">91</a>
Set character spacing mode	ESC SP p <sub>1</sub>	1B 20 p <sub>1</sub>	27 32 p <sub>1</sub>	$^{1/}_{120}$ $^{1/}_{180}$	Inch incs. (DRAFT) Inch incs. (LQ/NLQ)	<a href="#">92</a>
Absolute horizontal tabulation	ESC \\$ p <sub>1</sub> p <sub>2</sub>	1B 24 p <sub>1</sub> p <sub>2</sub>	27 36 p <sub>1</sub> p <sub>2</sub>	$^{1/}_{60}$	Inch increments	<a href="#">92</a>
Relative horizontal tabulation	ESC \ p <sub>1</sub> p <sub>2</sub>	1B 5C p <sub>1</sub> p <sub>2</sub>	27 92 p <sub>1</sub> p <sub>2</sub>	$^{1/}_{120}$ $^{1/}_{180}$	Inch incs. (DRAFT) Inch incs. (LQ/NLQ)	<a href="#">93</a>
Set horizontal tab stops	ESC D p <sub>1</sub> ... p <sub>k</sub> NUL	1B 44 p <sub>1</sub> ... p <sub>k</sub> 00	27 68 p <sub>1</sub> ... p <sub>k</sub> 00			<a href="#">94</a>
Horizontal tabulation	HT	09	09			<a href="#">94</a>
Set print direction (bidirectional or unidirectional)	ESC U p <sub>1</sub>	1B 55 p <sub>1</sub>	27 85 p <sub>1</sub>	p <sub>1</sub> = p <sub>1</sub> =	X' 00, X' 30 Bidirectional X' 01, X' 31 Unidirectional	<a href="#">95</a>

Command	Control sequence	Hexa-decimal	Decimal	Remark	See page
Set unidirectional print mode for one line	ESC <	1B 3C	27 60		<a href="#">95</a>
Select text alignment	ESC a p <sub>1</sub>	1B 61 p <sub>1</sub>	27 97 p <sub>1</sub>	Valid values p <sub>1</sub> : X' 00 Left-justif. X' 01 Centered X' 02 Right-justif. X' 03 Justified	<a href="#">96</a>

## Font design

Command	Control sequence	Hexa-decimal	Decimal	Remark	See page
Select font	ESC k p <sub>1</sub>	1B 6B p <sub>1</sub>	27 107 p <sub>1</sub>	Valid values p <sub>1</sub> : X' 00 Roman X' 01 Sans Serif X' 02 Courier X' 03 Prestige X' 04 Script X' 05 OCR-B X' 06 OCR-A X' 07 Orator-C X' 08 Orator X' 10 Data-Block	<a href="#">98</a>
Select national version	ESC R p <sub>1</sub>	1B 52 p <sub>1</sub>	27 82 p <sub>1</sub>		<a href="#">99</a>
Select character set	ESC t p <sub>1</sub>	1B 74 p <sub>1</sub>	27 116 p <sub>1</sub>	Valid values p <sub>1</sub> : X' 00 Epson ITALIC X' 01 Epson EXT GCT X' 02 User-def. character set	<a href="#">100</a>
Set/reset user-defined character set	ESC % p <sub>1</sub>	1B 25 p <sub>1</sub>	27 37 p <sub>1</sub>	p <sub>1</sub> = X' 01 Set p <sub>1</sub> = X' 00 Reset	<a href="#">100</a>
Copy current character set into user-defined character set	ESC : NUL p <sub>1</sub> NUL	1B 3A 00 p <sub>1</sub> 00	27 58 00 p <sub>1</sub> 00	Valid values p <sub>1</sub> : X' 00 Roman X' 01 Sans Serif X' 02 Courier X' 03 Prestige X' 04 Script X' 05 OCR-B X' 06 OCR-A X' 07 Orator-C X' 08 Orator X' 10 Data-Block	<a href="#">101</a>

Command	Control sequence	Hexa-decimal	Decimal	Remark	See page
Define user-defined characters	ESC & NUL p1 p2 p3 p4 p5 data	1B 26 00 p1 p2 p3 p4 p5 data	27 38 00 p1 p2 p3 p4 p5 data	p1 Code location First character p2 Code location Last character p3 Leading blank columns p4 Number of dot columns p5 Trailing blank columns data Dot information	<a href="#">102</a>
Select print quality	ESC x p1	1B 78 p1	27 120 p1	p1 = X' 00, X' 30 DRAFT p1 = X' 01, X' 31 LQ/NLQ	<a href="#">105</a>
Select character style	ESC q p1	1B 71 p1	27 113 p1	Valid values p1: X' 00 Normal X' 01 Outline X' 02 Shadow X' 03 Outline + shadow	<a href="#">105</a>
Set italics mode	ESC 4	1B 34	27 52		<a href="#">106</a>
Reset italics mode	ESC 5	1B 35	27 53		<a href="#">106</a>
Set boldface mode	ESC E	1B 45	27 69		<a href="#">106</a>
Reset boldface mode	ESC F	1B 46	27 70		<a href="#">106</a>
Set double strike mode	ESC G	1B 47	27 71		<a href="#">106</a>
Reset double strike mode	ESC H	1B 48	27 72		<a href="#">106</a>

Command	Control sequence	Hexa-decimal	Decimal	Remark	See page
Set subscript/superscript mode	ESC S p <sub>1</sub>	1B 53 p <sub>1</sub>	27 83 p <sub>1</sub>	p <sub>1</sub> = X' 00, X' 30 Superscript p <sub>1</sub> = X' 01, X' 31 Subscript	<a href="#">107</a>
Reset subscript/superscript mode	ESC T	1B 54	27 84		<a href="#">107</a>
Set condensed mode	SI ESC SI	0F 1B 0F	15 27 15		<a href="#">108</a>
Reset condensed mode	DC2	12	18		<a href="#">108</a>
Set expanded mode for one line	SO ESC SO	0E 1B 0E	14 27 14		<a href="#">108</a>
Set/reset expanded mode	ESC W p <sub>1</sub>	1B 57 p <sub>1</sub>	27 87 p <sub>1</sub>	p <sub>1</sub> = X' 00, X' 30 Reset p <sub>1</sub> = X' 01, X' 31 Set	<a href="#">109</a>
Reset expanded mode	DC4	14	20		<a href="#">109</a>
Set/reset double height mode	ESC w p <sub>1</sub>	1B 77 p <sub>1</sub>	27 119 p <sub>1</sub>	p <sub>1</sub> = X' 00, X' 30 Reset p <sub>1</sub> = X' 01, X' 31 Set	<a href="#">109</a>
Select print mode combination	ESC ! p <sub>1</sub>	1B 21 p <sub>1</sub>	27 33 p <sub>1</sub>		<a href="#">110</a>
Set/reset underscore mode	ESC - p <sub>1</sub>	1B 2D p <sub>1</sub>	27 45 p <sub>1</sub>	p <sub>1</sub> = X' 00, X' 30 Reset p <sub>1</sub> = X' 01, X' 31 Set	<a href="#">110</a>

Command	Control sequence	Hexa-decimal	Decimal	Remark	See page
Set/reset line marking mode	ESC (- ETX NUL SOH p <sub>1</sub> p <sub>2</sub>	1B 28 2D 03 00 01 p <sub>1</sub> p <sub>2</sub>	27 40 45 03 00 01 p <sub>1</sub> p <sub>2</sub>	p <sub>1</sub> Line position p <sub>2</sub> Line type	<a href="#">111</a>
Additional commands:					
Graphical change of sizes	ESC [ p <sub>1</sub> ; p <sub>2</sub> SP B	1B 5 B p <sub>1</sub> 3B p <sub>2</sub> 20 42	27 91 p <sub>1</sub> 59 p <sub>2</sub> 32 66		<a href="#">112</a>
Set national version and code page	ESC [ p <sub>1</sub> ; p <sub>2</sub> w	1B 5B p <sub>1</sub> 3B p <sub>2</sub> 77	27 91 p <sub>1</sub> 59 p <sub>2</sub> 119		<a href="#">113</a>
Set national version	ESC [ p <sub>1</sub> w	1B 5B p <sub>1</sub> 77	27 91 p <sub>1</sub> 119		<a href="#">113</a>
Set code page	ESC [ ; p <sub>2</sub> w	1B 5B 3B p <sub>2</sub> 77	27 91 59 p <sub>2</sub> 119		<a href="#">114</a>
Set character pitch and select font	ESC [ p <sub>1</sub> ; p <sub>2</sub> x	1B 5B p <sub>1</sub> 3B p <sub>2</sub> 78	27 91 p <sub>1</sub> 59 p <sub>2</sub> 120		<a href="#">115</a>
Select font	ESC [ p <sub>1</sub> x	1B 5B p <sub>1</sub> 78	1B 5B p <sub>1</sub> 78		<a href="#">116</a>
Set print quality (NLQ, LQ)	ESC [ p <sub>1</sub> SP X	1B 5B p <sub>1</sub> 20 58	27 91 p <sub>1</sub> 32 88		<a href="#">116</a>

## Bitmap graphics

Command	Control sequence	Hexa-decimal	Decimal	Remark		See page
Select graphics mode	ESC * p <sub>1</sub> p <sub>2</sub> p <sub>3</sub> data	1B 2A p <sub>1</sub> p <sub>2</sub> p <sub>3</sub> data	27 42 p <sub>1</sub> p <sub>2</sub> p <sub>3</sub> data	p <sub>1</sub> p <sub>2</sub> p <sub>3</sub>	Graphics mode Number of columns	<a href="#">117</a>
Reassign graphics mode	ESC ? p <sub>1</sub>  p <sub>2</sub>	1B 3F p <sub>1</sub>  p <sub>2</sub>	27 63 p <sub>1</sub>  p <sub>2</sub>	p <sub>1</sub>  p <sub>2</sub>	Graphics command Graphics mode	<a href="#">120</a>

## Miscellaneous commands

Command	Control sequence	Hexa-decimal	Decimal	Remark	See page
Control characters between X' 80 and X' 9F	ESC 7	1B 37	27 55		<a href="#">121</a>
Printing characters between X' 80 and X' 9F	ESC 6	1B 36	27 54		<a href="#">121</a>
Reset MSB to zero	ESC =	1B 3D	27 61		<a href="#">122</a>
Set MSB to one	ESC >	1B 3E	27 62		<a href="#">122</a>
Delete MSB default	ESC #	1B 23	27 35		<a href="#">122</a>
Set printer online	DC1	11	17		<a href="#">123</a>

Command	Control sequence	Hexa-decimal	Decimal	Remark	See page
Set printer offline	DC3	13	19		<a href="#">123</a>
Clear line buffer	CAN	18	24		<a href="#">123</a>
Delete character	DEL	7F	127		<a href="#">123</a>
Audible signal	BEL	07	07		<a href="#">124</a>
NUL function	NUL	00	00		<a href="#">124</a>
Additional commands:					<a href="#">124</a>
Command replacement \$\$	\$\$	24 24	36 36		
Command replacement \$\$/	\$\$/	24 24 2F	36 36 47		<a href="#">124</a>
Macro selection	ESC [ p <sub>1</sub> ; p <sub>2</sub> SP r	1B 5B p <sub>1</sub> 3B p <sub>2</sub> 20 72	27 91 p <sub>1</sub> 59 p <sub>2</sub> 32 114		<a href="#">125</a>
Set barcode	ESC [ ; p <sub>2</sub> ; p <sub>3</sub> ; p <sub>4</sub> ; p <sub>5</sub> ; p <sub>6</sub> SP z	1B 5B 3B p <sub>2</sub> 3B p <sub>3</sub> 3B p <sub>4</sub> 3B p <sub>5</sub> 3B p <sub>6</sub> 20 7A	27 91 59 p <sub>2</sub> 59 p <sub>3</sub> 59 p <sub>4</sub> 59 p <sub>5</sub> 59 p <sub>6</sub> 32 122		<a href="#">146</a>
Set/reset barcode	Set: ESC [ ? 0 h	1B 5B 3F 30 68	27 91 63 48 104		<a href="#">150</a>
	Reset: ESC [ ? 0 l	1B 5B 3F 30 6C	27 91 63 48 108		

## ESC / P2 commands

Befehl	Steuer-zeichen-folge	Hexa-dezimal	Dezimal	Bemerkung	Beschrei-bung Seite
Set page for-mat	ESC ( c p <sub>1</sub> p <sub>2</sub> p <sub>3</sub> p <sub>4</sub> p <sub>5</sub>	1B 28 63 p <sub>1</sub> p <sub>2</sub> p <sub>3</sub> p <sub>4</sub> p <sub>5</sub>	27 40 99 p <sub>1</sub> p <sub>2</sub> p <sub>3</sub> p <sub>4</sub> p <sub>5</sub>		<a href="#">page 127</a>
Set page length in defi-ned units	ESC ( C p <sub>1</sub> p <sub>2</sub> p <sub>3</sub>	1B 28 43 p <sub>1</sub> p <sub>2</sub> p <sub>3</sub>	27 40 67 p <sub>1</sub> p <sub>2</sub> p <sub>3</sub>		<a href="#">page 128</a>
Set absolute vertical print position	ESC ( V p <sub>1</sub> p <sub>2</sub> p <sub>3</sub>	1B 28 56 p <sub>1</sub> p <sub>2</sub> p <sub>3</sub>	27 40 86 p <sub>1</sub> p <sub>2</sub> p <sub>3</sub>		<a href="#">page 128</a>
Relative verti-kale Druckpo-sition festlegen	ESC ( v p <sub>1</sub> p <sub>2</sub> p <sub>3</sub>	1B 28 76 p <sub>1</sub> p <sub>2</sub> p <sub>3</sub>	27 40 118 p <sub>1</sub> p <sub>2</sub> p <sub>3</sub>		<a href="#">page 129</a>
Select font by pitch and point.	ESC X p <sub>1</sub> p <sub>2</sub> p <sub>3</sub>	1B 58 p <sub>1</sub> p <sub>2</sub> p <sub>3</sub>	27 88 p <sub>1</sub> p <sub>2</sub> p <sub>3</sub>		<a href="#">page 129</a>
Set unit	ESC ( U p <sub>1</sub> p <sub>2</sub>	1B 28 55 p <sub>1</sub> p <sub>2</sub>	27 40 85 p <sub>1</sub> p <sub>2</sub>		<a href="#">page 130</a>
Set horizontal Motion index(HMI)	ESC c p <sub>1</sub> p <sub>2</sub>	1B 63 p <sub>1</sub> p <sub>2</sub>	27 99 p <sub>1</sub> p <sub>2</sub>		<a href="#">page 130</a>
Assign charac-ter table	ESC ( t p <sub>1</sub> p <sub>2</sub> p <sub>3</sub> p <sub>4</sub>	1B 28 74 p <sub>1</sub> p <sub>2</sub> p <sub>3</sub> p <sub>4</sub>	27 40 116 p <sub>1</sub> p <sub>2</sub> p <sub>3</sub> p <sub>4</sub>		<a href="#">page 131</a>
Select charac-ter table	ESC t p <sub>1</sub>	1B 74 p <sub>1</sub>	27 116 p <sub>1</sub>		<a href="#">page 131</a>
Print data as characters	ESC ( ^ p <sub>1</sub> p <sub>2</sub> Daten	1B 28 5E p <sub>1</sub> p <sub>2</sub>	27 40 94 p <sub>1</sub> , p <sub>2</sub>		<a href="#">page 132</a>
Select graphics mode	ESC ( G p <sub>1</sub> p <sub>2</sub>	1B 28 47 p <sub>1</sub> p <sub>2</sub>	27 40 71 p <sub>1</sub> , p <sub>2</sub>		<a href="#">page 132</a>
Print raster graphics	ESC . p <sub>1</sub> p <sub>2</sub> p <sub>3</sub> p <sub>4</sub> p <sub>5</sub> p <sub>6</sub>	1B 2E p <sub>1</sub> p <sub>2</sub> p <sub>3</sub> p <sub>4</sub> p <sub>5</sub> p <sub>6</sub>	27 46 p <sub>1</sub> p <sub>2</sub> p <sub>3</sub> p <sub>4</sub> p <sub>5</sub> p <sub>6</sub>		<a href="#">page 133</a>

# Character set tables

## IBM all character set

## IBM set 1

## National versions of IBM set 1

	Character Code (Hex)												
	23	24	40	5B	5C	5D	5E	60	7B	7C	7D	7E	
1: USA	#	\$	@	[	\	]	^	'	{		}	~	
2: FRANCE	#	\$	à	°	ç	§	^	'	é	ù	è	“	
3: GERMANY	#	\$	§	Ä	Ö	Ü	^	'	ä	ö	ü	ß	
4: U.K.	£	\$	@	[	\	]	^	'	{		}	~	
5: DENMARK	#	\$	@	Æ	Ø	Å	^	'	æ	ø	å	~	
6: SWEDEN	#	¤	É	Ä	Ö	Å	Ü	é	ä	ö	å	ü	
7: ITALY	#	\$	@	°	\	é	^	ù	à	ò	è	ì	
8: SPAIN	Pt	\$	@	i	Ñ	¿	^	`	”	ñ	}	~	
9: JAPAN	#	\$	@	[	¥	]	^	`	{		}	~	
10: NORWAY	#	¤	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü	
11: DENMARK 2	#	\$	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü	
12: SPAIN 2	#	\$	á	i	Ñ	¿	é	`	í	ñ	ó	ú	
13: LATIN AM.	#	\$	á	i	Ñ	¿	é	Ü	í	ñ	ó	ú	
14: TURKEY	#	i	ï	Ç	Ö	ş	Ü	ğ	ç	ö	ş	ü	

IBM set 2

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	NUL		SP	0	@	P	'	p	Ç	É	á	é	l	ll	ó	≡
1		DC1	!	1	A	Q	a	q	ü	æ	í	é	ł	łł	ß	±
2		DC2	"	2	B	R	b	r	é	Æ	ó	é	ł	łł	Γ	≥
3	♥	DC3	#	3	C	S	c	s	â	ô	ú	ł	łł	łł	π	≤
4	♦	DC4	\$	4	D	T	d	t	ä	ö	ñ	ł	-	ł	Σ	ſ
5	♣	§	%	5	E	U	e	u	à	ò	Ñ	ł	łł	ł	σ	đ
6	♠		&	6	F	V	f	v	å	û	a	ł	łł	ł	μ	÷
7	BEL		,	7	G	W	g	w	ç	ù	o	ł	łł	ł	τ	≈
8	BS	CAN	(	8	H	X	h	x	ê	ÿ	ç	ł	łł	ł	Φ	°
9	HT		)	9	I	Y	i	y	ë	Ö	¬	ł	łł	ł	Θ	•
A	LF		*	:	J	Z	j	z	è	Ü	¬	ł	łł	ł	Ω	.
B	VT	ESC	+	;	K	[	k	{	ï	¢	½	ł	łł	ł	ð	√
C	FF		,	<	L	\	l		î	£	¼	ł	łł	ł	∞	n
D	CR		-	=	M	]	m	}	ì	¥	ı	ł	=	ł	ø	²
E	SO		.	>	N	^	n	~	Ä	Pt	«	ł	łł	ł	ε	■
F	SI		/	?	O	-	o		Å	f	»	ł	łł	ł	∩	SP

## National versions of IBM set 2

	Character Set Code (Hex)														
	23	24	40	5B	5C	5D	5E	60	7B	7C	7D	7E	9B	9D	
1: USA	#	\$	@	[	\	]	^	'	{		}	~	¢	¥	
2: FRANCE	#	\$	à	°	ç	§	^	'	é	ù	è	"	¢	¥	
3: GERMANY	#	\$	§	Ä	Ö	Ü	^	'	ä	ö	ü	ß	¢	¥	
4: U.K.	£	\$	@	[	\	]	^	'	{		}	~	¢	¥	
5: DENMARK	#	\$	@	[	\	]	^	'	{		}	~	ø	ø	
6: SWEDEN	#	¤	É	Ä	Ö	Å	Ü	é	ä	ö	å	ü	¢	¥	
7: ITALY	#	\$	@	°	\	é	^	ù	à	ò	è	ì	¢	¥	
8: SPAIN	Pt	\$	@	i	Ñ	¿	^	'	"	ñ	}	~	¢	¥	
9: JAPAN	#	\$	@	[	¥	]	^	'	{		}	~	¢	¥	
10: NORWAY	#	\$	@	[	\	]	^	"	{		}	~	ø	ø	
11: DEMARK 2	#	\$	@	[	\	]	^	'	{		}	~	ø	ø	
12: SPAIN 2	#	\$	á	i	Ñ	¿	é	'	í	ñ	ó	ú	¢	¥	
13: LATIN AM.	#	\$	á	i	Ñ	¿	é	Ü	í	ñ	ó	ú	¢	¥	
14: TURKEY	#	i	İ	Ç	Ö	ş	Ü	ğ	ç	ö	ş	ü	¢	¥	

## IBM code pages

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Epson EXT GCT

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0			SP	0	@	P	'	p	Ç	É	á	[dotted circle]	L	॥	α	≡
1			!	1	A	Q	a	q	ü	æ	í	[dotted circle]	⊥	ꝑ	ꝃ	±
2			"	2	B	R	b	r	é	Æ	ó	[solid circle]	⊤	ꝑ	ꝁ	≥
3			#	3	C	S	c	s	â	ô	ú		⊤	ꝑ	Ꝃ	≤
4			\$	4	D	T	d	t	ä	ö	ñ	-	-	ꝃ	Σ	ſ
5		§	%	5	E	U	e	u	à	ò	Ñ	‡	+	ꝁ	σ	ſ
6			&	6	F	V	f	v	å	û	a		ꝁ	ꝑ	ꝃ	÷
7			'	7	G	W	g	w	ç	ù	º	⊤		‡	τ	≈
8			(	8	H	X	h	x	ê	ÿ	¿	⊤	ꝑ	‡	ꝁ	°
9		)	9	I	Y	i	y	ë	Ö	–		ꝁ	⊤	ꝃ	ꝃ	•
A		*	:	J	Z	j	z	è	Ü	¬		॥	⊤	ꝁ	ꝃ	.
B		+	;	K	[	k	{	ï	¢	½	⊤	ꝑ	ꝑ	■	δ	√
C		'	<	L	\	l		î	£	¼	॥		■	∞	n	
D		-	=	M	]	m	}	ì	¥	í	॥	=		ꝑ	ꝃ	z
E		.	>	N	^	n	~	Ä	Pt	«	‡			ε	■	
F		/	?	O	_	o		Å	f	»	⊤	±	■	∩	SP	

## National versions of Epson EXT GCT

	Character Code (Hex)												
	23	24	40	5B	5C	5D	5E	60	7B	7C	7D	7E	
1: USA	#	\$	@	[	\	]	^	'	{		}	~	
2: FRANCE	#	\$	à	°	ç	§	^	'	é	ù	è	"	
3: GERMANY	#	\$	§	Ä	Ö	Ü	^	'	ä	ö	ü	ß	
4: U.K.	£	\$	@	[	\	]	^	'	{		}	~	
5: DENMARK	#	\$	@	Æ	Ø	Å	^	'	æ	ø	å	~	
6: SWEDEN	#	¤	É	Ä	Ö	Å	Ü	é	ä	ö	å	ü	
7: ITALY	#	\$	@	°	\	é	^	ù	à	ò	è	ì	
8: SPAIN	Pt	\$	@	i	Ñ	¿	^	'	"	ñ	}	~	
9: JAPAN	#	\$	@	[	¥	]	^	'	{		}	~	
10: NORWAY	#	¤	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü	
11: DENMARK 2	#	\$	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü	
12: SPAIN 2	#	\$	á	i	Ñ	¿	é	'	í	ñ	ó	ú	
13: LATIN AM.	#	\$	á	i	Ñ	¿	é	Ü	í	ñ	ó	ú	
14: TURKEY	#	i	İ	Ç	Ö	Ş	Ü	ğ	ç	ö	ş	ü	
15: LEGAL	#	\$	§	°	'	"	¶	'	©	®	†	™	

## Epson ITALIC

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0			SP	0	@	P	'	p			SP	0	@	P	'	p
1			!	1	A	Q	a	q			!	1	A	Q	a	q
2			"	2	B	R	b	r			"	2	B	R	b	r
3			#	3	C	S	c	s			#	3	C	S	c	s
4			\$	4	D	T	d	t			\$	4	D	T	d	t
5			%	5	E	U	e	u			%	5	E	U	e	u
6			&	6	F	V	f	v			&	6	F	V	f	v
7			'	7	G	W	g	w			'	7	G	W	g	w
8			(	8	H	X	h	x			(	8	H	X	h	x
9			)	9	I	Y	i	y			)	9	I	Y	i	y
A		*	:	J	Z	j	z			*	:	J	Z	j	z	
B		+	;	K	[	k	{			+	;	K	[	k	{	
C		'	<	L	\	l				'	<	L	\	l	/	
D		-	=	M	]	m	}			-	=	M	]	m	}	
E		.	>	N	^	n	~			.	>	N	^	n	~	
F		/	?	O	_	o				/	?	O	_	o		

## National versions of Epson ITALIC (1)

	Character Code (Hex)											
	23	24	40	5B	5C	5D	5E	60	7B	7C	7D	7E
1: USA	#	\$	@	[	\	]	^	'	{		}	~
2: FRANCE	#	\$	à	°	ç	§	^	'	é	ù	è	"
3: GERMANY	#	\$	§	Ä	Ö	Ü	^	'	ä	ö	ü	ß
4: U.K.	£	\$	@	[	\	]	^	'	{		}	~
5: DENMARK	#	\$	@	Æ	Ø	Å	^	'	æ	ø	å	~
6: SWEDEN	#	¤	É	Ä	Ö	Å	Ü	é	ä	ö	å	ü
7: ITALY	#	\$	@	°	\	é	^	ù	à	ò	è	ì
8: SPAIN	Pt	\$	@	í	Ñ	¿	^	'	"	ñ	}	~
9: JAPAN	#	\$	@	[	Ø	]	^	'	{		}	~
10: NORWAY	#	¤	É	Æ	Ø	Å	Ü	é	æ	È	å	ü
11: DENMARK 2	#	\$	É	Æ	Ø	Å	Ü	é	æ	È	å	ü
12: SPAIN 2	#	\$	á	í	Ñ	¿	é	'	í	ñ	ó	ú
13: LATIN AM.	#	\$	á	í	Ñ	¿	é	Ü	í	ñ	ó	ú
14: TURKEY	#	í	İ	Ç	Ö	Ş	Ü	ğ	ç	ö	ş	ü
15: LEGAL	#	\$	§	°	'	"	¶	`	©	®	†	™

## National versions of Epson ITALIC (2)

	Character Code (Hex)													
	A3	A4	C0	DB	DC	DD	DE	E0	FB	FC	FD	FE		
1: USA	#	\$	@	[	l	]	^	'	{	/	}	~		
2: FRANCE	#	\$	à	°	ç	§	^	'	é	ù	è	"		
3: GERMANY	#	\$	§	Ä	Ö	Ü	^	'	ä	ö	ü	ß		
4: U.K.	£	\$	@	[	l	]	^	'	{	/	}	~		
5: DENMARK	#	\$	@	Æ	Ø	Å	^	'	æ	Ý	å	~		
6: SWEDEN	#	¤	É	Ä	Ö	Å	Ü	é	ä	ö	å	ü		
7: ITALY	#	\$	@	°	l	é	^	ù	à	ò	è	ì		
8: SPAIN	Pt	\$	@	i	Ñ	ç	^	'	"	ñ	}	~		
9: JAPAN	#	\$	@	[	Ø	]	^	'	{	/	}	~		
10: NORWAY	#	¤	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü		
11: DENMARK 2	#	\$	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü		
12: SPAIN 2	#	\$	á	i	Ñ	ç	é	'	í	ñ	ó	ú		
13: LATIN AM.	#	\$	á	i	Ñ	ç	é	Ü	í	ñ	ó	ú		
14: TURKEY	#	i	İ	Ç	Ö	Ş	Ü	ğ	ç	ö	ş	ü		
15: LEGAL	#	\$	§	°	'	"	¶	'	©	®	†	™		

**OCR-A**

	0	1	2	3	4	5	6	7
0	NUL	DLE	SP	0	@	P	h	p
1	SOH	DC1	!	1	A	Q	a	q
2	STX	DC2	"	2	B	R	b	r
3	ETX	DC3	#	3	C	S	c	s
4	EOT	DC4	\$	4	D	T	d	t
5	ENQ	NAK	%	5	E	U	e	u
6	ACK	SYN	&	6	F	V	f	v
7	BEL	ETB	'	7	G	W	g	w
8	BS	CAN	(	8	H	X	h	x
9	HT	EM	)	9	I	Y	i	y
A	LF	SUB	*	:	J	Z	j	z
B	VT	ESC	+	;	K	[	k	{
C	FF	FS	-	<	L	\	l	
D	CR	GR	-	=	M	]	m	}
E	SO	RS	.	>	N	^	n	„
F	SI	US	/	?	O	¥	o	■

**ISO 8859-1**

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0			SP	0	@	P	'	p		NBSP	°	À	Ð	à	ð	
1			!	1	A	Q	a	q		j	±	Á	Ñ	á	ñ	
2			"	2	B	R	b	r		ç	²	Â	Ò	â	ò	
3			#	3	C	S	c	s		£	³	Ã	Ó	ã	ó	
4			\$	4	D	T	d	t		€	Ž	Ä	Ô	ä	ô	
5			%	5	E	U	e	u		¥	µ	Å	Õ	å	õ	
6			ε	6	F	V	f	v		Š	¶	Æ	Ö	æ	ö	
7			,	7	G	W	g	w		§	.	Ç	×	ç	÷	
8			(	8	H	X	h	x		š	ž	È	Ø	è	ø	
9			)	9	I	Y	i	y		©	¹	É	Ù	é	ù	
A			*	:	J	Z	j	z		ª	º	Ê	Ú	ê	ú	
B			+	;	K	[	k	{		«	»	Ë	Û	ë	û	
C			,	<	L	\	l			¬	Œ	Ì	Ü	ì	ü	
D			-	=	M	]	m	}		SHY	œ	Í	Ý	í	ý	
E			.	>	N	^	n	~		®	Ÿ	Î	Þ	î	þ	
F			/	?	O	_	o			-	¿	Ï	ß	ï	ÿ	

---

# Code tables

## ISO 7-bit code (international version)

	0	1	2	3	4	5	6	7	
0	NUL	DLE	SP	0	@	P	'	p	0
1	SOH	DC1	!	1	A	Q	a	q	1
2	STX	DC2	"	2	B	R	b	r	2
3	ETX	DC3	#	3	C	S	c	s	3
4	EOT	DC4	\$	4	D	T	d	t	4
5	ENQ	NAK	%	5	E	U	e	u	5
6	ACK	SYN	&	6	F	V	f	v	6
7	BEL	ETB	'	7	G	W	g	w	7
8	BS	CAN	(	8	H	X	h	x	8
9	HT	EM	)	9	I	Y	i	y	9
A	LF	SUB	*	:	J	Z	j	z	A
B	VT	ESC	+	;	K	[	k	{	B
C	FF	IS4	,	<	L	\	l		C
D	CR	IS3	-	=	M	]	m	}	D
E	SO	IS2	.	>	N	^	n	?	E
F	SI	IS1	/	?	O	_	o	DEL	F
	0	1	2	3	4	5	6	7	

### Example

The letter A has the code 41 (ISO 7-bit code).

## ISO 7-bit code (German national version)

	0	1	2	3	4	5	6	7	
0	NUL	DLE	SP	0	\$	P	'	p	0
1	SOH	DC1	!	1	A	Q	a	q	1
2	STX	DC2	"	2	B	R	b	r	2
3	ETX	DC3	#	3	C	S	c	s	3
4	EOT	DC4	\$	4	D	T	d	t	4
5	ENQ	NAK	%	5	E	U	e	u	5
6	ACK	SYN	&	6	F	V	f	v	6
7	BEL	ETB	'	7	G	W	g	w	7
8	BS	CAN	(	8	H	X	h	x	8
9	HT	EM	)	9	I	Y	i	y	9
A	LF	SUB	*	:	J	Z	j	z	A
B	VT	ESC	+	;	K	Ä	k	ä	B
C	FF	IS4	,	<	L	Ö	l	ö	C
D	CR	IS3	-	=	M	Ü	m	ü	D
E	SO	IS2	.	>	N	^	n	ß	E
F	SI	IS1	/	?	O	_	o	DEL	F
	0	1	2	3	4	5	6	7	

### Example

The letter A has the code 41 (ISO 7-bit code).

## Meaning of the control characters in the code tables

NUL	Filler
SOH	Start of header
STX	Start of text
ETX	End of text
EOT	End of transmission
ENQ	Enquiry
ACK	Positive acknowledgment
BEL	Audible alarm
BS	Backspace
HT	Horizontal tabulation
LF	Line feed
VT	Vertical tabulation
FF	Form feed
CR	Carriage return
SO	Shift out
SI	Shift in
SP	Space
DLE	Data link escape
DC1	Device control character 1
DC2	Device control character 2
DC3	Device control character 3
DC4	Device control character 4
NAK	Negative acknowledgment
SYN	Synchronize
ETB	End of transmission block
CAN	Cancel
EM	End of message (end mark)
SUB	Substitute
ESC	Escape
IS4	Information separator 4
IS3	Information separator 3
IS2	Information separator 2
IS1	Information separator 1
DEL	Delete

## Hexadecimal -> decimal conversion and vice versa

	<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>F</b>	
<b>0</b>	00	16	32	48	64	80	96	112	128	144	160	176	192	208	224	240	<b>0</b>
<b>1</b>	01	17	33	49	65	81	97	113	129	145	161	177	193	209	225	241	<b>1</b>
<b>2</b>	02	18	34	50	66	82	98	114	130	146	162	178	194	210	226	242	<b>2</b>
<b>3</b>	03	19	35	51	67	83	99	115	131	147	163	179	195	211	227	243	<b>3</b>
<b>4</b>	04	20	36	52	68	84	100	116	132	148	164	180	196	212	228	244	<b>4</b>
<b>5</b>	05	21	37	53	69	85	101	117	133	149	165	181	197	213	229	245	<b>5</b>
<b>6</b>	06	22	38	54	70	86	102	118	134	150	166	182	198	214	230	246	<b>6</b>
<b>7</b>	07	23	39	55	71	87	103	119	135	151	167	183	199	215	231	247	<b>7</b>
<b>8</b>	08	24	40	56	72	88	104	120	136	152	168	184	200	216	232	248	<b>8</b>
<b>9</b>	09	25	41	57	73	89	105	121	137	153	169	185	201	217	233	249	<b>9</b>
<b>A</b>	10	26	42	58	74	90	106	122	138	154	170	186	202	218	234	250	<b>A</b>
<b>B</b>	11	27	43	59	75	91	107	123	139	155	171	187	203	219	235	251	<b>B</b>
<b>C</b>	12	28	44	60	76	92	108	124	140	156	172	188	204	220	236	252	<b>C</b>
<b>D</b>	13	29	45	61	77	93	109	125	141	157	173	189	205	221	237	253	<b>D</b>
<b>E</b>	14	30	46	62	78	94	110	126	142	158	174	190	206	222	238	254	<b>E</b>
<b>F</b>	15	31	47	63	79	95	111	127	143	159	175	191	207	223	239	255	<b>F</b>
	<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>F</b>	

---

# Interfaces

The following describes the two interfaces provided on the 90152-12 interface module.

## Serial V.24/RS-232 C interface

General data:

- Protocols: DTR, X-ON/X-OFF
- Transfer rate: 600, 1200, 2400, 4800, 9600, 19200 baud
- Parity: even, odd, none, ignored
- Character length: 7 bits, 8 bits
- Stop bits: send = 2 stop bits, receive = 1 stop bit

**Pin assignment**

<b>Pin</b>	<b>Designation</b>			<b>Explanation</b>	<b>Direction from/to printer</b>
	<b>EIA</b>	<b>DIN</b>	<b>CCITT</b>		
1	AA	E1	101	PG: Protective Ground	
2	BA	D1	103	TXD: Transmit Data	x
3	BB	D2	104	RXD: Receive Data	x
4	CA	S2	105	RTS: Request to Send	x
5	CB	M2	106	CTS: Clear to Send	x
6	CC	M1	107	DSR: Data Set Ready	x
7	AB	E2	102	SG: Signal Ground	
20	CD	S1.2	108.2	DTR: Data Terminal Ready	x

### DTR protocol

The following signal lines are used:

Pin	Designation			Explanation	Direction from/to printer
	EIA	DIN	CCITT		
1	AA	E1	101	PG: Protective Ground	
3	BB	D2	104	RXD: Receive Data	x
7	AB	E2	102	SG: Signal Ground	
20	CD	S1.2	108.2	DTR: Data Terminal Ready	x

The printer sets the DTR signal to ON (positive level) as soon as it is ready to receive data after power-on.

The printer sets the DTR signal to OFF when less than 256 bytes are free in the buffer or when the printer enters the Stop mode. Further data is stored until the printer buffer is completely full; any additional data is lost.

The DTR signal returns to ON when the printer exits from the Stop mode and at least 512 bytes are free in the printer buffer.

### X-ON/X-OFF protocol

The following signal lines are used:

Pin	Designation			Explanation	Direction from/to printer
	EIA	DIN	CCITT		
1	AA	E1	101	PG: Protective Ground	
2	BA	D1	103	TXD: Transmit Data	x
3	BB	D2	104	RXD: Receive Data	x
5	CB	M2	106	CTS: Clear to Send	x
6	CC	M1	107	DSR: Data Set Ready	x
7	AB	E2	102	SG: Signal Ground	
20	CD	S1.2	108.2	DTR: Data Terminal Ready	x

After power-on, the DTR signal and the RTS signal are set to ON (positive level). When the host sets the DSR and CTS signals to ON, the printer sends an X-ON signal to the host. The printer is then ready to receive.

The data flow is controlled with the control characters DC1 (X-ON) and DC3 (X-OFF). The printer sends the control character DC1 to the host when it is ready to receive.

Ready to receive means:

- Power-on
- 512 bytes free in the printer buffer

The printer sends the control character DC3 to the output system 255 bytes before “Printer buffer full”. If further data is sent to the printer after the control character, it sends a second DC3 to the printer 128 bytes before buffer overflow. The control characters are sent in the sequence DC1, DC3, DC1, DC3 etc. The only exception in the sequence is the second DC3 before buffer overflow.

## Parallel Centronics interface

### Pin assignment

Pin	Signal name	Explanation	Direction from/to printer
1	STROBE	When the signal is set to logical zero, the data byte DATA 1 - DATA 8 is stored in the printer buffer.	x
2	DATA 1	Data line LSB	x
3	DATA 2	Data line	x
4	DATA 3	Data line	x
5	DATA 4	Data line	x
6	DATA 5	Data line	x
7	DATA 6	Data line	x
8	DATA 7	Data line	x
9	DATA 8	Data line MSB	x
10	ACKN	The printer indicates that it has received a character or a control character and that it is ready to receive another character by setting this signal to zero.	x
11	BUSY	The printer cannot accept further data when this signal is 1.	x
12	PE	Is set to 1 under the following conditions: – No paper – Paper out – Paper jam	x
13	SELECT	This signal is always one. It indicates that the printer is always online and ready.	x
31	INIT	When this signal goes to zero, the ACKN signal of the printer is set to one.	x
32	FAULT	This signal is always one. It only goes to zero when the printer is turned off.	x

### Protocol description

After power-on, the **PE** signal goes to zero. The **SELECT** signal and the **FAULT** signal become one.

### Timing

The host sets the data lines (**DATA 1** - **DATA 8**) according to the character to be transferred.

After a timeout of 0.5 microseconds the host sends a **STROBE** pulse with a length of at least 0.5 microseconds. The character is stored in the printer buffer and the printer sends a **BUSY** signal to the host. When the data byte is stored completely in the printer buffer, the printer sends a **BUSY** and an **ACKN** signal to the host.

The **ACKN** signal informs the host that a data byte has been received and that the printer is ready to receive another character.

When the printer buffer is full, the **BUSY** signal is not reset to stop the data stream from the host. The **BUSY** signal is reset only when at least 256 bytes are free in the printer buffer.

When the Stop button is pressed, the **BUSY** signal remains one and the **ACKN** signal is not sent.

If at least 256 bytes are free in the printer buffer, pressing the Start button causes the **BUSY** signal to be reset and an **ACKN** signal to be sent to the host.

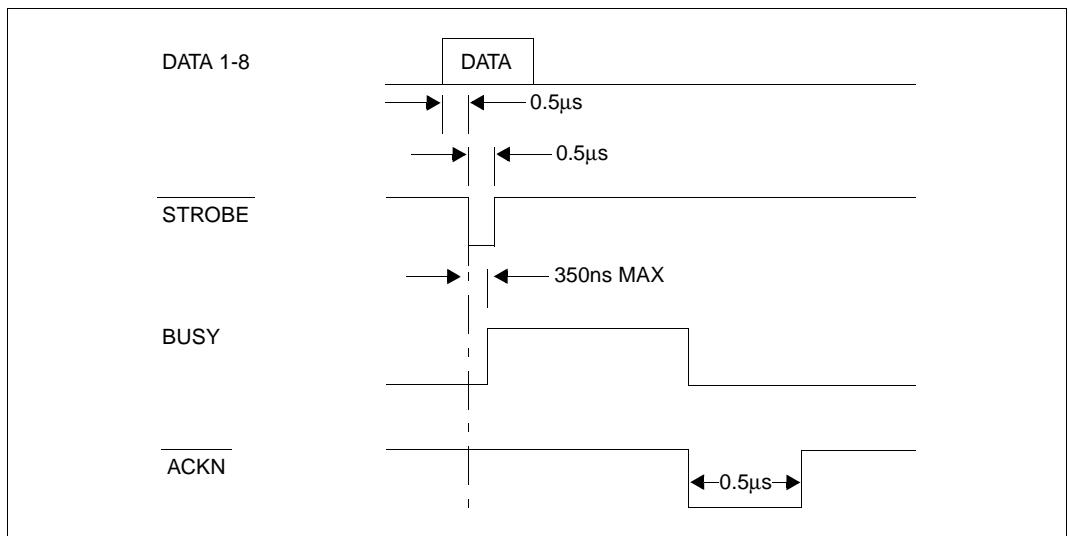


Figure 9: Timing of the Centronics interface

## Use with two interfaces

The “Both interfaces active” mode can be selected in the menu (see [2]).

In this mode the printer buffer is subdivided into two parts with 256 bytes each.

After power-on, both interfaces are ready to receive data.

If a byte is received first at the serial interface, the parallel interface is blocked by the `BUSY` signal. The serial interface is active and uses the set protocol.

If a byte is received first at the parallel interface, the serial interface is blocked by the `DTR` signal (`DTR = OFF`) or, depending on the protocol, by transmission of `XOFF`.

A maximum of 256 bytes can be received at the serial interface even though the parallel interface is active. All further bytes are lost except for the byte received last.

If the printer buffer of the serial interface is completely free and if no further data is received within 60 seconds, both interfaces are again available.

If the printer buffer of the parallel interface is completely free and if no further data is received within 60 seconds, the data of the printer buffer of the serial interface is processed and the serial interface is activated.

---

# Related publications

## Ordering manuals

- [1] **9015 Printer  
ECMA Emulation  
Programmer Reference Guide**

*Target group*  
Programmers

*Contents*

Description of the control characters of the ECMA emulation. Information on the operation of the printer with BS2000, SINIX and at workstations.

- [2] **9015 Printer  
Operating Manual**

*Target group*  
Users putting the printer in service

*Contents*

Putting in service, error information, upkeep

*Applications*

Placing in service

- [3] **9016 Printer  
Operating Manual**

*Target group*  
Users putting the printer in service

*Contents*

Putting in service, error information, upkeep

*Applications*

Placing in service

[4] **9014 Printer  
ECMA-Emulation  
Programmer Reference Guide**

*Target group*  
Programmers

*Contents*

Description of the control characters of the ECMA emulation. Information on the operation of the printer with BS2000, SINIX and at workstations.*Zielgruppe Programmierer*

## Ordering manuals

The manuals listed above can be ordered from your local Siemens branch.

Please apply to your local office for ordering the manuals.

---

# **Environmental protection**

## **Environmentally friendly product design and development**

This product has been designed in accordance with the Siemens standard "environmentally friendly product design and development".

This means that the designers have taken into account decisive criteria such as durability, selection of materials and coding, emissions, packaging, the ease with which the product can be dismantled and the extent to which it can be recycled.

This saves resources and thus reduces the harm done to the environment.

## **Note on saving energy**

Devices that do not have to be switched on permanently should not be switched on until they are used and should be switched off during long breaks and on completion of work.

## **Note on dealing with consumables**

Please dispose of printer consumables and batteries in accordance with local government regulations.

## **Note on labeling plastic housing parts**

Please avoid sticking your own labels on plastic housing parts wherever possible, since this makes it difficult to recycle them.

## **Take-back, recycling and disposal**

For details on take-back and reuse of devices and consumables within Europe, contact your Siemens branch office/subsidiary or our recycling center in Paderborn:

**Tel. +49 5251 8180-10**

**Fax. +49 5251 8180-15**

## **Further information on environmental protection**

The Siemens AG representative for environmental protection will be pleased to answer any further questions you may have concerning environmental protection.

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Comments  
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Corrections

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Comments on 9014, 9015, 9015 E, 9016 Printer  
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